The Official Publication of the Southern California Computer Society
the international computer society

sccs INTERFACE™

Vol. 1, Issue 10,
January 1977
$1.50 USA

In This Issue:

Low Cost Graphing

An Interview With Ryal Poppa

A Four Port Serial I/O Board

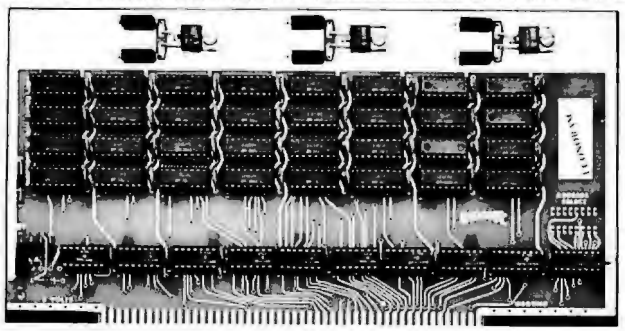
Jack Gammon

A Very Tiny Language

from Parts to Peripherals...

CAVE COMPUTER CORP.

YOUR ONE STOP, MAIL-ORDER COMPUTER STORE.



ECONORAM™ $99.95

OVER TWO YEARS OF EXPERIENCE SELLING 4K X 8 BOARDS HAS SHOWN US **EXACTLY WHAT YOU WANT IN A MEMORY BOARD KIT.**

--**YOU WANT LOW POWER** TO STRETCH YOUR POWER SUPPLY. ANY COMPANY CAN CLAIM LOW POWER; NOT EVERY COMPANY OFFERS A SPEC TO BACK IT UP. WE **GUARANTEE** CURRENT CONSUMPTION **UNDER 750 MA**, WITH THE AVERAGE BOARD FALLING BETWEEN 600 AND 650 MA.

--**YOU WANT S-100 BUSS COMPATIBILITY**...AND ECONORAM IS FULLY COMPATIBLE.

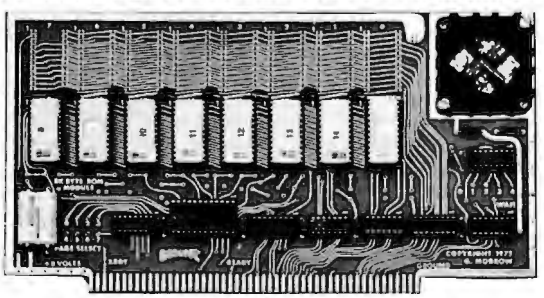
--**YOU WANT CLEAN AND UNAMBIGUOUS DATA TRANSFER**...WHICH IS WHY WE BUFFERED OUR ADDRESSES, DATA LINES, AND OUTPUTS LONG BEFORE THE OTHER GUYS CAUGHT ON.

--**YOU WANT A FAST BOARD.** BY USING MEMORIES GUARANTEED AT 450 NS WORST CASE OVER THE FULL TEMP RANGE, WE CAN **GUARANTEE** THIS BOARD TO RUN AT **ZERO WAIT STATES (500 NS OR BETTER).** A 450 NS MEMORY ALSO ALLOWS FOR ANY PROPAGATION DELAYS IN SUPPORT CIRCUITRY.

--**YOU WANT QUALITY, AND WE DELIVER IT:** FROM THE EPOXY GLASS, DOUBLE SIDED, PLATE THROUGH BOARD...TO THE LOW PROFILE SOCKETS... THE OPTIMIZED THERMAL DESIGN...THE DIPSWITCH ADDRESS SELECTOR... THE LOW POWER SCHOTTKY SUPPORT ICS...THE GUARANTEE WE OFFER ON ALL PARTS USED IN ECONORAM...AND MORE.

--**YOU WANT LOW COST.** BECAUSE OF OUR PURCHASING POLICIES AND QUANTITY BUYING, WE CAN STILL DELIVER A BOARD OF THIS QUALITY FOR UNDER $100. YOU CAN PAY LESS, AND YOU CAN GET LESS. BUT **IF YOU WANT THE BEST COMBINATION OF VALUE AND ECONOMY...ECONORAM GIVES YOU BOTH.**

ALSO AVAILABLE ASSEMBLED, TESTED, AND WARRANTEED FOR ONE YEAR FOR $129.95. DISCOUNTS ON ALL KITS AVAILABLE FOR GROUP PURCHASES.



ECONOROM T.M.

GIVE YOUR CPU A FRIEND: A HOME FOR PROGRAMS AND ROUTINES!

OUR BASIC ECONOROM BOARD IS 4K X 8 WORTH OF ERASEABLE ROM, WHICH YOU CAN **PROGRAM WITH ANY PROGRAM OR ROUTINE YOU WANT** (OR HAVE US PROGRAM IT FOR YOU). SIMILAR FEATURES AND SAME QUALITY AS OUR ECONORAM---AND ALSO **VERY LOW POWER:** 5V @ ½A, -12V @ 150 MA. WE OFFER SEVERAL OPTIONS:

BASIC ECONOROM BOARD (4K X 8).....$179.95
SMALLER ECONOROM BOARD (2K X 8).....$135.00
BIGGER ECONOROM BOARD (8K X 8; HOLDS 8K BASIC).....$269.95
8080 SOFTWARE BOARD (THIS IS OUR 4K BOARD, PROGRAMMED WITH EDITOR, ASSEMBLER, AND MONITOR ROUTINES FOR THE 8080...A VALUABLE FIRST STEP IF YOU'RE TRYING TO GET AWAY FROM MACHINE LANGUAGE PROGRAMMING. INFO PACKAGE AVAILABLE THAT DESCRIBES THE FUNCTION OF ALL SOFTWARE FOR $2.95 (REFUNDABLE WITH ORDER).....$189.95

Low Power Schottky

74LS00	$0.36
74LS01	0.36
74LS02	0.36
74LS04	0.42
74LS08	0.38
74LS10	0.36
74LS11	0.38
74LS14	1.38
74LS20	0.36
74LS21	0.38
74LS22	0.38
74LS27	0.38
74LS30	0.36
74LS32	0.38
74LS37	0.53
74LS38	0.53
74LS42	1.25
74LS74	0.56
74LS75	0.85
74LS109	0.60
74LS124	2.50
74LS125	0.75
74LS126	0.75
74LS132	1.50
74LS138	1.38
74LS139	1.38
74LS155	1.38
74LS157	1.25
74LS160	1.85
74LS161	1.85
74LS162	1.85
74LS163	1.85
74LS168	1.87
74LS169	1.87
74LS174	1.38
74LS175	1.35
74LS221	1.38
74LS240	1.88
74LS257	1.25
74LS258	1.38
74LS273	2.25
74LS283	1.20
74LS367	1.00
74LS368	1.00
74LS377	1.88
74LS378	1.38
81LS95	1.13
81LS96	1.13
81LS97	1.13
81LS98	1.13

We Now Distribute Knowledge!

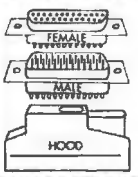
We are happy to carry the Adam Osborne & Associates series of books on microcomputers, as lucid and complete a treatment of the subject as we've seen to date. All books postpaid in the USA; set of all three books available for only **$25.00**.

VOL 1 "An Introduction to Microcomputers" Order book #2001. Gives the basics of uP based systems.....$7.00

VOL 2 This recent addition gives up-to-date information on microprocessors --- equivalent to hundreds of pages of data sheets. Order book #3001.....$12.50

VOL 3 "8080 Programming for Logic Design" #4001 $7.50

LOOKING FOR A GOOD CONNECTION?



25 PIN RS-232 CONNECTORS: sub-mini D type.

Male plug with plastic hood, part #DB25P $3.95

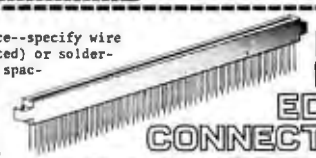
Female jack, part #DB25S $3.95

REGULATORS

309K	+5V, 1A...$1.25
320/12T	-12V, $A...1.25
340/5K	+5V, 1A....1.25
340/5T	+5V, 1A....1.75
340/6T	+6V, 1A....1.75
340/8K	+8V, 1A....1.75
340/8T	+8V, 1A....1.75
340/12T	+12V, 1A...1.75
340/15K	+15V, 1A...1.85
340/15T	+15V, 1A...1.75
340/18K	+18V, 1A...1.75
340/24K	+24V, 1A...1.75
340/24T	+24V, 1A...1.75

Now you have a choice--specify wire wrap pins (illustrated) or solder-tail with .250" row spacing. For IMSAI and Altair peripherals. Wire wrap part # S-100WW. Solder-tail part # S-100ST.

#S-100ST is ideal for the IMSAI motherboard.



100 PIN EDGE CONNECTOR

$5 EACH--$22 FOR 5

LOW PROFILE sockets WIRE WRAP

Soldertail, tin plated		3 level, gold plated	
14 pin	10/$1.95	14 pin	10/$3.70
16 pin	10/$2.15	16 pin	10/$3.85
18 pin	10/$2.75	18 pin	1/$0.75
20 pin	10/$3.10	22 pin	1/$1.50
22 pin	10/$3.50	24 pin	1/$1.00
24 pin	10/$3.60	28 pin	1/$1.25
36 pin	10/$5.50	36 pin	1/$1.35
40 pin	10/$6.15	40 pin	1/$1.75

CRYSTALS

WE OFFER TWO DIFFERENT TYPES OF CRYSTALS---

STATEK XTALS: .01% accuracy in a TO-5 can. Excellent for fixed frequency applications, or use with binary dividers to generate more frequencies. Choose from (in KHz): 10.000, 12.800, 15.360, 16.000, 16.384, 18.641, 19.200, 20.480, 30.720, 31.500, 32.768, 38.400, 40.960, 60.000, 76.800, 100.00, 153.60, and 240.00.

SENTRY XTALS: Series mode, fundamental, wire leads. Choose from 4, 5, 8, 9, 10, 12, 15, 18, and 20 MHz. (Note: 18 MHz = 8080 clock, 4 MHz = PACE clock freq.)

AN OFFER YOU CAN'T REFUSE!

2102-Lls.....10/$15!

Not retests...full spec (450 ns full temp range), ultra-low power prime units. We mean it when we say you get the best for less...find out for yourself. **Orders must be postmarked before 3/31/77**

The tip of the iceberg:

This page is just a sampling of what you'll find in our latest flyer...we also carry Vector products, like their 8800V prototyping board, their beautiful new Vector-Pak enclosures, and helpful tools like the Slit-N-Wrap and Wiring Pencil...not to mention Vectorboard and all their useful little terminals. Then there are our chip sets... other kits...power supplies...components...the latest TTL...CMOS...if you want to get plugged into a great source of parts that delivers from stock, send for our flyer.

GODBOUT

BILL GODBOUT ELECTRONICS
BOX 2355, OAKLAND AIRPORT, CA 94614

TERMS

TERMS: No CODs; Cal res add tax. Add 50¢ to orders under $10; over $10 add 5% handling/shping. Call (415) 562-0636, 24 hrs, to place BankAmericard® or Mastercharge® credit card orders.

Society Feedback Poll

Circle the appropriate Reader Service Card numbers to register your opinion.

The name SCCS should be changed to reflect our national and international scope.

170 I agree (send a suggestion)
169 I am indifferent
168 I disagree

A number of members have expressed interest in lifetime memberships. Would you be interested in becoming a lifetime member if the cost were in the range of $100 to $150?

157 Yes
156 No

We are encouraging readers to submit short contributions as well as full length articles for publication. Are short statements of fact or opinion of interest to you?

164 I like them
163 I am indifferent
162 I do not feel that they are appropriate

We have run interviews of a number of industry leaders. Do you like this sort of article?

167 I like them (who else should we interview?)
166 I am indifferent
165 I don't feel they are appropriate

SCCS INTERFACE READER SERVICE CARD

January 1977 Issue. Use before May 1977

(Please type or print)

Name _____ Title _____

Company _____ Telephone (A/C) _____

Home Address _____

City _____ State _____ Country _____ Zip _____

Signature _____

Please send information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170

SCCS INTERFACE READER SERVICE CARD

January 1977 Issue. Use before May 1977

(Please type or print)

Name _____ Title _____

Company _____ Telephone (A/C) _____

Home Address _____

City _____ State _____ Country _____ Zip _____

Signature _____

Please send information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170

FAST FEEDBACK
ON SCCS

Unlike a commercial publication, *SCCS Interface* belongs to its readers – the members of SCCS. You can use the magazine as a forum for your ideas and you can shape it by giving us feedback.

We would like to experiment with the reader service card as a feedback channel. On the back of this flap there is a short poll regarding the magazine and the Society. You may respond by circling the appropriate numbers on the reader service card and returning it.

We also encourage you to submit questions to be used in these polls and to drop us a note if none of the replies reflects your opinion.

ON PRODUCTS AND SERVICES

At the same time as you give us feedback on what we are doing, you may use the reader service card to get more information about the products and services advertised or reviewed in this issue of SCCS Interface. Reader service requests help suppliers communicate with us and help the Society by showing them our interest.

First Class
Permit No.
2830
Santa Monica
California

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

SCCS Interface
P.O. Box 5429
Santa Monica,
California 90405

First Class
Permit No.
2830
Santa Monica
California

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

SCCS Interface
P.O. Box 5429
Santa Monica,
California 90405

A STAR IS BORN

TDL's STARTLING NEW SYSTEM MONITOR BOARD

Replaces 4 basic boards in your system.
Integrates their functions fully into a single module.
Radically simplifies the development of your system.
Adds more versatility and performance than you'd believe possible.

- **Fully S100 bus compatible** • Power on start-up so no front panel is needed • Wait state circuitry • Fully solder masked and silk-screened Documentation includes complete software listings of the Zapple Monitor • Minimizes interfacing problems • Like having your own resident technical expert to help set up your system • Saves space for more cards • To duplicate the SMB, you'd have to spend $500 or more on separate boards.
- **2 Serial I/O and 1 Parallel I/O port.** Both serial I/O ports may be individually configured for any baud rate between 110 and 9600, in either RS232 or Current Loop configuration. The parallel port is 8 bits in or out with a status bit. All ports directly controllable by the monitor.
- **1200 BAUD audio cassette interface.** Has its own dedicated serial port and utilizes an asynchronous phase-encoding technique for high reliability and b[illegible]eed tolerance. Most important, ALL TDL software will be available on cassette in this format.
- **2K of high speed low power RAM.** Uses 1Kx4, 350ns static RAM chips, and does double duty for either add-on monitor routines (for your own special I/O) or program workspace.
- **2K Zapple Monitor in Masked ROM** gives you perfect system control direct from the console. It has 27 Commands (including 3 user defined) and offers program debug routines.

Let TDL's System Monitor Board star in your computer system. Hurry, use coupon below to order, or call (609) 921-0321

SYSTEM MONITOR BO[illegible] Kit $295 Assembled & Tested $395

TECHNICAL DESIGN LABS RESEARCH PARK Building H 1101 State Road Princeton N.J. 08540

Please send your SYSTEM MONITOR BOARD. (N.J. residents add 5% sales tax)
☐ KIT ONLY @ $295. ☐ ASSEMBLED & TESTED @ $395.

Name _____ Street _____ Zip _____
City _____ State _____ ☐ Charge Card Data: Exp. Date _____
I enclose ☐ Check ☐ Money Order Exp. Date _____
☐ BankAmericard
☐ Master Charge
Signature _____
☐ Send COD. I enclose 25% deposit
☐ Send your FREE CATALOG.

TECHNICAL DESIGN LABS
Research Park Bldg. H
1101 State Road
Princeton, N.J.
08540

TECHNICAL DESIGN LABS

Circle No. 2 on Inquiry Card

Join SCCS...
the international society for computer buffs

An informal, international organization of computer buffs, the Southern California Computer Society (SCCS) was founded in 1975. Today its roster boasts more than 8000 members. This explosive growth stems in part from the benefits that members enjoy because of SCCS's busy, well planned agenda of activities and services. Here are some of the functions which the society offers or plans to help computer professionals and nonprofessionals alike:

Conducting meetings, seminars, and lectures... Publishing books, newsletters, and a monthly magazine... Providing informal technical assistance... Arranging classes... Developing and maintaining workshops... Providing scholarships for classes and memberships... Rendering an ombudsman service... Arranging group purchasing agreements... Performing job placement services... Supplying video presentations for society and chapter meetings... Helping local chapters organize meetings and recruit members... Coordinating relationships with other technical societies and specialty groups.

No other society does more for its members. But why not join and find out for yourself. Your annual dues include a subscription to Interface, SCCS's official publication.

Distributed monthly, SCCS Interface covers all aspects of microcomputing: applications, software and hardware. It features tutorial presentations (for beginners and to help break down the barriers between hardware and software people), how-to-do-it articles, and articles on more advanced theory and technique.

SCCS Interface readers are kept up on the latest products, services and books as well as news of the industry, and of the society and its chapters.

The magazine serves as an open, often experimental forum for the membership, featuring short contributions by members as well as full length articles.

Membership in SCCS is open to everyone who has a sincere interest in the computer arts and sciences. And remember: whether your interest is professional or nonprofessional, there's no better way to become informed and stay informed. Convinced? Then just send your $10.00 annual membership dues today and begin to enjoy the benefits of belonging to SCCS. Not convinced? Then write or call to get the society's membership folder, which describes the society's aims, services, and activities in more detail.

Southern California Computer Society
P. O. Box 54751
Los Angeles, California 90054

SCCS Executive Committee

Fields, Louis G.
(President)
11662 Sunset Blvd.
Los Angeles, CA 90049
(213) 472-0388

Press, Larry
(Vice President)
1702 Ashland
Santa Monica, CA 90405
(213) 396-0048

Murrow, Gene
(Secretary)
2385 Roscomare Rd.
Los Angeles, CA 90024

Brady, Wayne
(Treasurer)
1218 9th Street, #2
Santa Monica, CA 90401
(213) 395-0866

SCCS Board of Directors

Alpert, Leda
c/o Travel Coordinators
9060 Santa Monica Blvd.
Los Angeles, CA 90069
(213) 278-7933

Armstrong, Art
3345 Moore Street
Los Angeles, CA 90066

Attwood, George
5711 Ravenspur Drive, #71
Rancho Palos Verdes, CA
(213) 377-7703

Borders, John
Box 525
Port Hueneme, CA 93041
(805) 985-1631

Carlson, Ron
14014 Panay Way, #255
Marina del Rey, CA 90291

C. deBaca, Phil
4833 W. 136th Street
Hawthorne, CA 90251
(213) 676-8693

Fite, Lew
620 Illinois Court, #9
El Segundo, CA 90245
(213) 322-6028

Gott, Barry
1233 Hermosa Ave.
Hermosa Beach, CA 90245
(213) 372-2195

Hirschmann, Rudy
1001 Kagawa Street
Pacific Palisades, CA 90272
(213) 454-1277

Huffman, Joe
1010 Washburn Street
Corona, CA 91720

Hussey, Alan
9961 Lurline Ave., #126
Chatsworth, CA 91311

King, Chris
18262 Valley Vista
Tarzana, CA 91356
(213) 345-6218

Lotter, Russ
P.O. Box 9459
North Hollywood, CA 91609

McCabe, Jim
5695 Medeabrook Place
Agoura, CA 91301

Mehl, Ross
1041 N. Shelburne Street
La Habra, CA 90631

Salem, Jim
260 S. Spalding Drive
Beverly Hills, CA 90212

Silver, Jerry
4500 Woodman Ave., #C-237
Sherman Oaks, CA 91403
(213) 877-7056

SCCS INTERFACE™

THE OFFICIAL PUBLICATION OF THE SOUTHERN CALIFORNIA COMPUTER SOCIETY

the international computer society

VOL. I, ISSUE 10 JANUARY 1977

Editor: Larry Press

Design Director: Tom Woodward

Assistant Editor: Karen Wolff

Associate Editors: Bob Albrecht, Jim Carlstedt, Phil Feldman, Jim Levin, Tom Rugg, Don Tarbell, Lew Whitaker, Tricia Wood

Cover Photo by William Warren

Cover Story

Our cover this month features Ryal Poppa, the president of Pertec Computer Corporation. Pertec recently signed a letter of intent to acquire MITS, which makes them by far the largest manufacturer/distributor in our field. An interview with Mr. Poppa is on page 26.

FEATURES:

Low Cost Graphing 23
by Art Armstrong

Here Comes PCC 26

A Four Port Serial I/O Board 30
by John Borders

Jackgammon 34
by Karen Wolff and Phil Feldman

VTL/2: A Very Tiny Language 39
by Gary J. Shannon

Computer Store Survey 48
by Larry Press

DEPARTMENTS:

Cover Story 3

Editorial 4

The President's Message 7

Calendar 9

New Clubs 10

Society News 10

Chapter News 12

Update 15

Book Reviews 18

Applications Exchange 21

Letters to the Editor 22

Science Fiction Corner 43

New Products 44

Helpful Hints, or What I Had to Learn to Build a Computer 50

Unclassified 53

PUBLISHER'S STATEMENT

Interface magazine is published monthly by the Southern California Computer Society, 1702 Ashland, Santa Monica, California 90405, USA. Subscription rate $1.00 with membership.

All editorial content and effort are contributed at no cost to the Society. Opinions expressed in by-lined articles do not necessarily reflect the opinion of this magazine or the Southern California Computer Society. Mention of products by trade name in editorial material or advertisements contained herein in no way constitutes an endorsement of the product or products by this magazine or by the Southern California Computer Society.

DIRECT ALL EDITORIAL CORRESPONDENCE TO: P.O. Box 49707, Los Angeles, Ca. 90049.

DIRECT SOCIETY CORRESPONDENCE TO: P.O. Box 5429, Santa Monica, CA 90405.

Application to mail at second-class postage rates is pending at Santa Monica, California 90406 and at additional mailing offices.

POSTMASTER: Please send change of address form 5993 and undelivered copies to: Southern California Computer Society, P.O. Box 5429, Santa Monica, Ca. 90405.

DIRECT ALL ADVERTISING INQUIRIES TO:

New York, Eastern Seaboard
Robert Baer
51 E. 42nd Street
New York, New York 10017
(212) 697-7769

New England
Lee Arpin
Box 227
51 Cold Chester Road
Weston, Mass. 02193
(617) 899-5613

Northern California, Pacific Northwest
George O'Callaghan
499 Hamilton Ave.
Palo Alto, California 94301
(415) 327-4100

Southern California, Southwest
Richard Sherwood of
Sherwood & Company
8899 Beverly Blvd.
Los Angeles, California 90048
(213) 550-8271

Circulation and Distribution
Phil C. deBaca
4833 W. 136th St.
Hawthorne, California 90251
(213) 676-8693
Between 1 and 8 pm

©Southern California Computer Society 1976. Entire contents, all rights reserved. Written permission to reprint required.

A New Year's Retrospective

In the January 1976 issue of *Byte* magazine, Carl Helmers wrote an editorial called "Join the Club". He listed three broad areas in which a club might serve: in the dissemination of information about computers and their use, in providing a place for fraternization and group identity, and in fostering trade and learning about what is available. He continued with speculation on and discussion of specific activities in each area and finally discussed advantages of a nationwide affiliation and concluded that SCCS seemed to be on the right track.

A rebuttal was presented in a subsequent (August) *Byte* editorial. In that editorial, Helmers paraphrased Sol Libes of the Amateur Computer Group of New Jersey and Gary Coleman of the Midwestern Affiliation of Computer Clubs who argued that a national organization is unnecessary in our field because there is no federal bureaucracy (like the FCC in amateur radio) with which to do battle. More significant, to me at least, was their assertion that all of the activities and services which a club could provide can be done locally or regionally and that a national "empire" is therefore extraneous.

If Libes and Coleman's assertion can be shown to be true, then I for one am 100% with them. It seems to me that SCCS is an experiment designed to test their hypothesis and that the issue they raise is of paramount importance to us.

I think that it is still too early to tell if they are right or not; however, their challenge is so central that I would like to reflect upon our progress to date within the context that they have established.

It seems to me that SCCS had three major goals this year at the national level. They were to establish a non-commercial, highly independent magazine which would provide an open forum for and unbiased information to the members; to make large volume group purchases in order to get price discounts and save local sales taxes, and to help form and support chapters. We had many other programs, but they were either local to Southern California or less important than these.

I don't feel that we have completely succeeded at any of these, but neither have we failed conclusively. Our magazine obviously went down a long, costly detour; however, I feel that we are back on the right track. I won't rehash our mistakes, but will state that it seems to me that we can have the sort of magazine we wanted if we care to.

The biggest cost of the magazine has been that it has diverted our energy from other areas. Let me assure those of you who have not had the dubius pleasure of attending our board meetings that 90% of the time and effort spent was on our publication. It is my goal to free the board from that burden. Furthermore, we lost control of the content of *Interface* even before publication was interrupted. The resultant lack of information gave rise to an impression of a lack of candor where in fact we lacked a communication channel. That is no longer the case.

Next on my list is group purchase. Our group purchase program has been a mixed bag. We have collectively purchased about $150,000 worth of equipment at substantial savings. On the other hand, we have learned the hard way that a one-man, volunteer organization is unstable and is not up to running a large business. We have lost considerable money in group purchase, through poor accounting and business practices and because we have been ripped off; we have had a major problem with non-delivery of a prepaid order. As a result, there are people whose orders have not been filled for a long time, and they have been offered partial refunds. *Fulfilling our obligation to those people is our most pressing short term priority,* for they have in essence subsidized hundreds of satisfied group purchase participants.

In light of the problems we have had, group purchases have been temporarily suspended, but they should be underway again on a more business like basis soon.

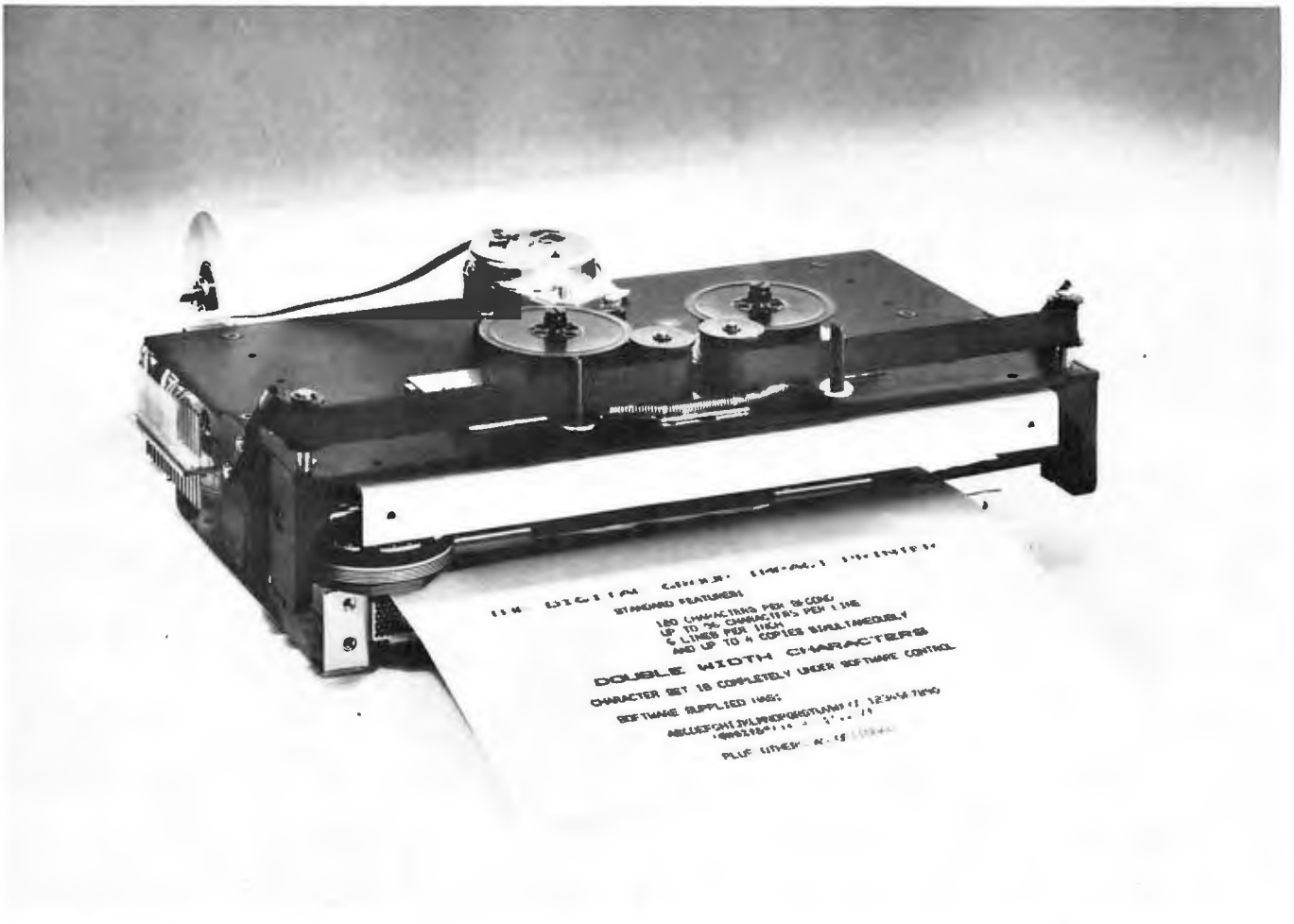
Next comes the question of chapters. A number of chapters have formed throughout the country and even in foreign countries. We have provided free liability coverage, seed money loans, informal advice and encouragement and a model in Los Angeles; however, I feel that our support of chapters has been far short of what it can be. I am encouraged to see that the board has set up a chapters committee and seems serious about it.

So, we have three inconclusive experiments under way, and if these aren't enough, Helmers and others have suggested many other programs which we might undertake. The results are still inconclusive because we have made several serious mistakes in judgment and because we over-extended ourselves (or to put it another way, we overestimated the amount of enthusiastic help we would get).

Libes and Coleman have made a serious and sincere challenge to our need to be and we should thank them for it. I hope that by next January we will have shown them that they were wrong. If we can't, I for one will withdraw into my local chapter.

Oh yes, I can't close without stating my opinion that if we are a national organization we need a new name. I would like feedback on this editorial and one very concrete way in which you might respond is to suggest an alternative name to "SCCS", if you agree with me.

Larry Press
Editor



Print Your Heart Out.

With help from the Digital Group, naturally.

Now, that small computer system you own or have been considering for personal or business use suddenly becomes a lot more usable—with the addition of a full-size *impact* printer from the Digital Group. A printer designed for small computers that need big output (like yours).

With the Digital Group printer, you can print your heart out...and it won't cost an arm and a leg. The Digital Group printer is available for less than $500. That's right—$500.

Just look at these specifications:

- Fast—120 characters per second
- 96 characters per line
- 12 characters per inch horizontal
- 6 lines per inch
- Makes up to 4 copies simultaneously
- Character set and pitch variable under software control—double width characters, etc.
- 5 x 7 character matrix
- Ribbon has built-in re-inkers for a life of 10,000,000 characters
- Paper can be either a standard 8½-inch roll, fanfold or cut page
- Interfaces to 8-bit parallel ports

There are lots of capabilities and outstanding features of the Digital Group printer...and (as always) the best news is our price. Kit prices start as low as $495 for the printer and interface card. It simply can't be beat.

Find out all the facts about the Digital Group printer now. Just fill in the coupon below or give us a call for the details. We think you'll find a place for our printer in your system ...and in your heart.

---

the digital group

P.O. Box 6528
Denver, Colorado 80206
(303) 777-7133

Quick. I want to print my heart out.
Send me all the details on your full-size impact printer.

Name _____

Address _____

City/State/Zip _____

Please print.

Circle No. 3 on Inquiry Card

The POLY 88 Microcomputer System

If you are into computers or considering a system, the POLY 88 is the machine to contemplate.

HARDWARE

• Popular 8080 central processor • Single-board CPU with ROM, RAM, vectored interrupt, real time clock, single-step logic and serial I/O • Video interface card – generates video to TV monitor and provides parallel keyboard input port • Serial and cassette mini-cards plug directly into CPU with ribbon cables • Cassette • ROM monitor with powerful debugger, video software, bootstrap loader • Backplane and power supply on one board simplifies construction • Rugged 6 amp power supply • All circuit boards are high quality, double-sided with plated-through holes • System is compatible with a wide range of Altair peripherals • Minimum point to point wiring means that the POLY 88 kit can go together in three evenings!

ABOUT SOFTWARE

Software is the reason the POLY 88 was designed. The operator can proceed from higher level languages like BASIC to developing machine code with the aid of our assembler. Our BASIC is a full 8K BASIC with character and byte manipulation. Best of all, the programmer is finally free of the teletype emulation mode so the video display can be used to full advantage.

The video display provides a unique opportunity to write new types of programs and games. Characters (16 lines of 64) and graphics (48 by 128 grid) are part of the processor's memory, so the display may be altered rapidly — the entire screen written in less than 20 milliseconds.

POLY 88 hardware provides many additional features that programmers have come to expect, such as vectored interrupt and real time clock.

See it at your local computer store.

ARE YOU NEW TO COMPUTERS?

The POLY 88 was designed for ease of use. No one should have to learn all the inner workings of computers just to enjoy one at a reasonable price. With the POLY 88, you can "play" pre-developed programs or explore the world of computer languages as your interests expand.

THE POLY 88 IS FOR EVERYONE

Want to develop a new computer language? Want to fight Klingons? The POLY 88 provides a firm foundation upon which to build your interests and develop your skills.

POLY 88 SYSTEM PRICES:

SYSTEM 1 — Kit includes 8080 vectored interrupt processor with real time clock, ½ K of RAM and 1K monitor on ROM: Video Terminal Interface displays 16 lines of 32 characters on a video screen and has a keyboard input port; cabinet, backplane, and power supply; complete assembly, operation and theory manual. $595.

SYSTEM 2 — System 1 plus 64 character line option and Byte/biphase cassette interface kit. $690.

SYSTEM 3 — System 2 plus 8K of RAM with BASIC and assembler programs on cassette tape. $990.

SYSTEM 4 — The complete kit. It includes system 3 *and* TV monitor, keyboard and cassette recorder with all necessary cables and connectors. $1350.

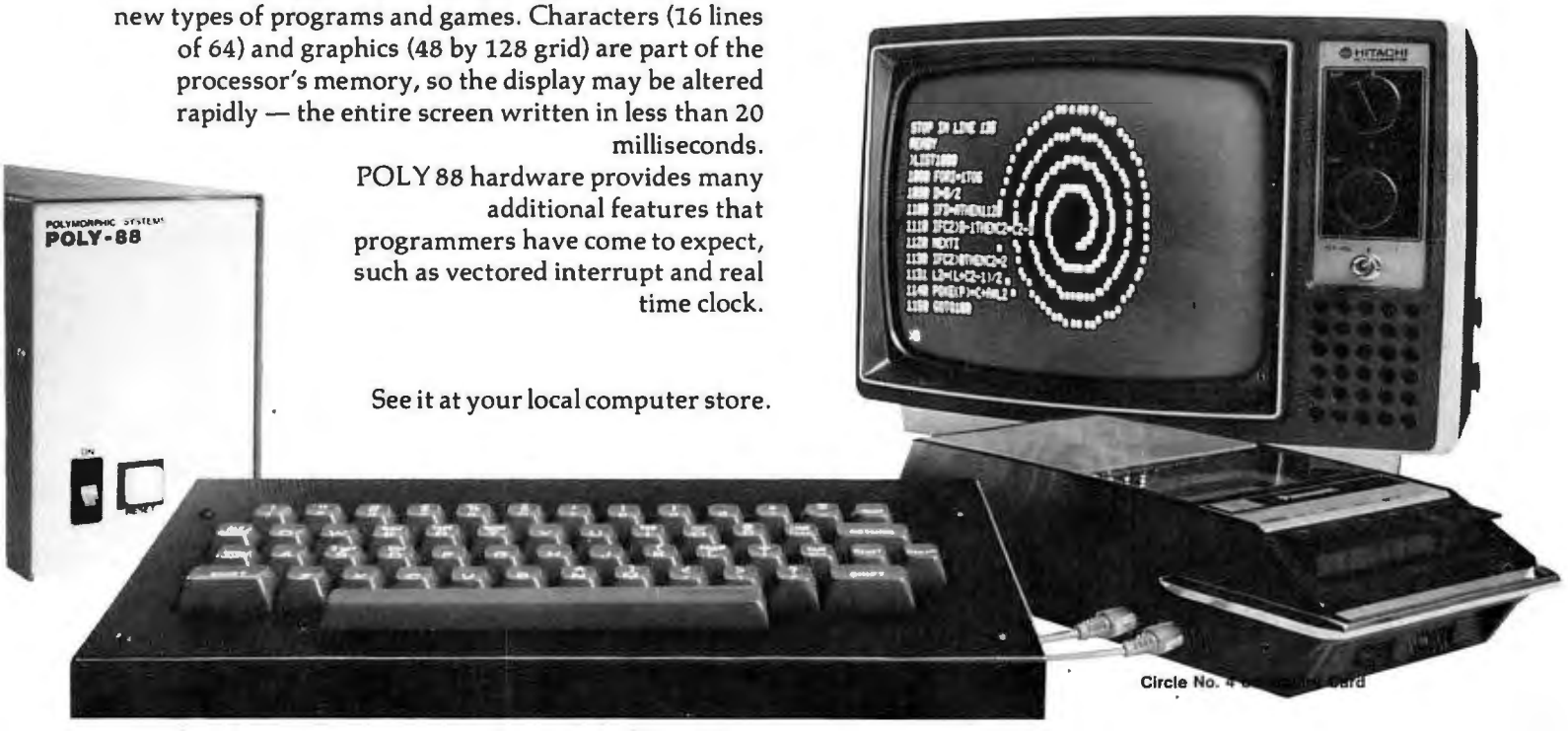
SYSTEM 7 — System 4 assembled, tested and ready to run. $1750.

ACCESSORIES — 8K RAM kit, $300. Assembled $385
POLY I/O Ideaboard, hardware prototyping kit board. $55.
Analog Interface (1 channel) kit. $145.

Prices effective until January 15, 1976. Prepaid orders shipped postpaid.

PolyMorphic Systems

737 S. Kellogg, Goleta, CA 93017
(805) 967-2351



Circle No. 4 on Reader Service Card

The President's Message

This Is Not A Society Of Computers!

It was through a most remarkable creation of current technology that all of this came about. LSI (Large Scale Integration) is the technique whereby perhaps 10,000 transistors are created and interconnected at once to form, among other things, the heart of the microcomputer. These are made photographically (three hundred at a time) on a thin disc of silicon metal (i.e., sand). The low cost, low power and high reliability of this method is what has led to today's computer revolution. Ironically, this leads us back to an even earlier tool made of sand. Man has used it among other clypsidric computers in the measurement of time and other calculations, the hour glass.

But a tool for use by mankind is what the microcomputer, the hour glass, and preceeding that, the stone axe (mostly silicon) really represent. These are all tools to extend man's reach, strength, memory, or his ability to manipulate numbers. SCCS, *the international computer society,* is another tool or mechanism created to serve the needs and interests of mankind. It is a non-profit educational organization created to bring together *people* and their *ideas* as they relate to microcomputers; definitely not a society of computers!

These new machines are remarkable and exciting in their new potential. That potential can only be realized and applied by *people* who are informed and educated about them. You, our members, represent that primary driving force of interest, information and creativity in this education.

The interdisciplinary opportunities that exist when people of diverse backgrounds, education and interests come together are truly exciting. At a recent chapter meeting I noticed two new members. One of them, whom I knew, is a graduate engineer, physician and chief of a major rehabilitation department. He was there for help in getting his new IMSAI kit running. He'll be applying his machine in the study of muscle and nerve potentials. When the second new member, sitting next to him, introduced himself, we found that he was in the dance department at UCLA. He was also interested in electro-myolograms, biofeedback and recordings related to dance movements. At the same meeting there were significant pioneers in speech synthesis, x-ray enhancement and education. I look forward to following the fantastic potential of this intellectual goulash.

The splendid progress and fine style set by the revitalized "SCCS Interface" is heartwarming. I would like to take this opportunity to thank and commend the many members who worked so hard in bringing this about. Special notice must also go to the advertisers who have helped support us. Without their aid we could obviously not bring you so fine a publication. One advertiser has dramatically demonstrated his support and confidence by doubling the size of his ad and prepaying the cost for the entire year. Many thanks. In that connection, many members have asked about lifetime memberships. We hope to make an announcement on that soon. Please indicate your interest by circling the number "200" on the enclosed inquiry card. Among the many member benefits we anticipate, we are now offering special discount tickets for the Personal Computer Fairs, page 42, and the West Coast Computer Faire. Those of you who are in the area are also invited to attend three free evening sessions on "How to Build Your Own Computer" in conjunction with the International Micro-Electronics Show (NEPCON), inside back cover.

The aggregation of orders for computer parts, to obtain quality discounts has always been valuable to us. This month we're going to again have the benefit of one form of such service. Dr. Rudi Herschman, a director of SCCS (prof. German department, USC), is putting together a special order of an SCCS-designed "8800A power booster transformer", page.

This then is a society of many diverse people and their ideas, helping each other. As the silica (silicon and the breath of life oxygen) sand in our 1977 hour glass starts flowing, I hope this new year will bring you the health and happiness to enjoy the wonders of this new, and still largely silicon technology.

Try a light pen, you'll like it!

Respectfully,

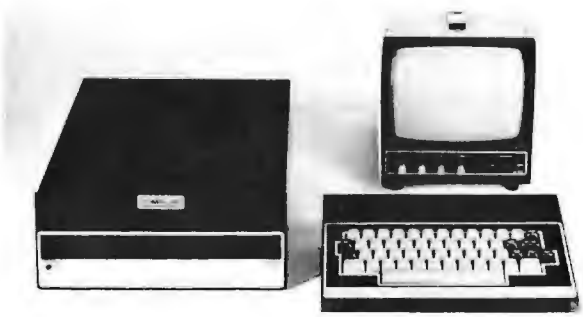
Louis G. Fields
President

VISIT OUR STORE

Here's why:

- our COMPAL-80 computer is a complete, fully assembled and tested system that is ready to go
- we have 5 systems always up and running in the store without any wires hanging out! Try out our powerful extended BASIC, applications programs, games and 8080 assembler
- our people are friendly, intelligent, fully informed about micro-computer hardware and software, and are eager to help you
- our classes in BASIC and 8080 assembly language are professionally taught and feature significant "hands on" experience – a necessary ingredient to becoming a competent programmer
- we support you with a 6-months guarantee, maintenance contracts, and we're always here to help you

After you've bought a COMPAL-80 computer you'll agree with our other satisfied customers that a positive, enjoyable personal computing experience begins with a visit to our store!



COMPUTER™ POWER & LIGHT INC.

12321 Ventura Blvd., Studio City, CA 91604 (West of Laurel Canyon) 213 760-0405
Open 12 to 10 Tuesday-Thursday, 12 to 5 Friday-Sunday (closed Mondays)

Bank financing arranged. Also Credit Cards and Cash.

©COMPUTER POWER & LIGHT INC., 1976. ALL RIGHTS RESERVED.

Circle No. 5 on Inquiry Card

Calendar

January 28
Amateur Computer Group of New Jersey 6800/6500 Users' Group meeting 7:00 P.M., U.C.T.I., Scotch Plains. Contact John Loofbourrow at (201) 233-7068 for information.

February 9
SCCS Board Meeting. Call (213) 472-0388 for exact time and place.

February 12
SMUG, The Southern California SWTPCO MP 6800 Users Group meets at 10:00 A.M. at A-Vid Electronics 1655 E. 28th Street, Long Beach, Ca. 90806. Call (213) 426-5526 for details.

February 19
Computer Music Symposium. For information contact Bill Sinclair (213) 249-1402 or write to Box 54751, Los Angeles, Ca. 90054. If you wish to order tickets, send $4.00 (for each SCCS or IEEE member and their guests) and an SASE to the above address.

February 19
SCCS LSI-11 interest group meets at 12 noon at Orville Wright School, just before each general meeting. Call (213) 681-7047 for information.

February 22
Pasadena (SCCS) meeting. Meets last Tuesday of the month at 7:00 P.M. at the Pasadena Central Library. Bit-slice machines club, vector graphics club and exotic languages club. For information call (213) 681-7047.

February 28
Minnesota Computer Society (SCCS) meeting. Place to be announced. Contact Jean Rice for information, (612) 941-1051.

March 9
SCCS Board Meeting. Call (213) 472-0388 for exact time and place.

March 5
VCCS, Ventura County Computer Society (SCCS) meeting 10:00 A.M. at the Camarillo Library, 3100 Ponderosa Drive. Contact Bill Cowley, 985-2631 or Fred Moeckel 982-5852 for details.

March 19
The SCCS General meeting coincides with the Personal Computer Show at the Los Angeles Hyatt House Hotel and will be held there rather than at Orville Wright School. There will be discounts on tickets for members.

March 28
Minnesota Computer Society (SCCS) meeting. Place to be announced. Contact Jean Rice for information, (612) 941-1051.

March 29
Pasadena (SCCS) meeting. Meets last Tuesday of the month at 7:00 P.M. at the Pasadena Central Library. Bit-slice machines club, vector graphics club and exotic languages club. For information call (213) 681-7047.

March 30
VCCS, Ventura County Computer Society (SCCS) meeting 7:00 P.M. at the Camarillo Library, 3100 Ponderosa Drive. Contact Bill Cowley, 985-2631 or Fred Moeckel 982-5852 for details.

April 13
SCCS Board Meeting. Call (213) 472-0388 for exact time and place.

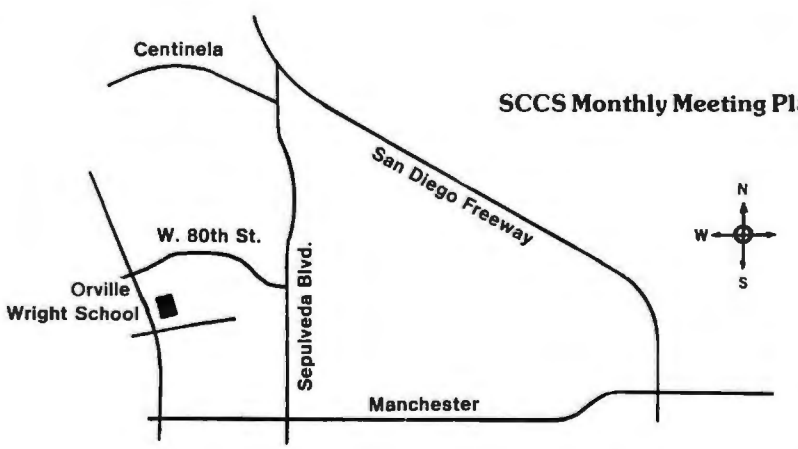
April 15-17
The First West Coast Computer Faire. San Francisco Civic Auditorium. Two and a half days of talks and exhibitions. Suggestions and questions should be directed to Jim Warren, Faire Chairperson, Star Route Box 111, Woodside, Ca. 94062 or Bob Reiling, Operations Coordinator, 193 Thompson Square, Mountain View, Ca. 94043.

April 25-29
AEDS (Association for Educational Data Systems) Conference 1977: Ft. Worth, Texas, April 25-29, with president E. Ronald Carruth officiating. AEDS is a non-profit, private educational organization founded in 1962 by a group of professional educators and technical specialists in eduation applications. For information, write them at 1201 16th St., S.W. Washington D.C. 20036.

April 23
SCCS General Meeting at the Orville Wright School (see map). Program begins at 1 P.M.

April 25
Minnesota Computer Society (SCCS) meeting. Place to be announced. Contact Jean Rice for information, (612) 941-1051.

SCCS Monthly Meeting Place:



New Clubs

Mexico City

Carlos de Leon is interested in forming a Mexico City Chapter. Carlos is an engineer who designs pipelines for natural gas. This work involves much computation so he began with a TI programmable calculator.

When he met Lou Fields at the Altair Convention, he still was under the impression that "a byte was some good eating". Now he is hooked and wants to find colleagues in the Mexico City area.

Carlos may be reached at Avenida Chapultepec, No. 318-603, Mexico 7, D.F. His phone number is 5-28-5264.

Las Vegas

A new chapter is being formed in the Las Vegas Area by Quentin C. West, 15 Ballerina, Henderson, Nevada 89015, (702) 565-9418.

South Side of Chicago

Roy Emerson (SCCS # 5063) (312) 388-2962, 14904 S. Calis Ave., Posen, Ill. 60469. Contact for club.

Southern New Jersey

William Staatse is interested in forming a chapter in Southern New Jersey. He may be reached at Box 947 Mcquire AFB, N.J. 08641 or (609) 723-5977.

Palos Verdes Peninsula

The Palos Verdes, Ca. Chapter will meet at the Peninsula Library at Peninsula Center on January 18th at 7:30 P.M. Contact George Attwood, (213) 377-7703 for information.

Society News

Lawsuit Filed

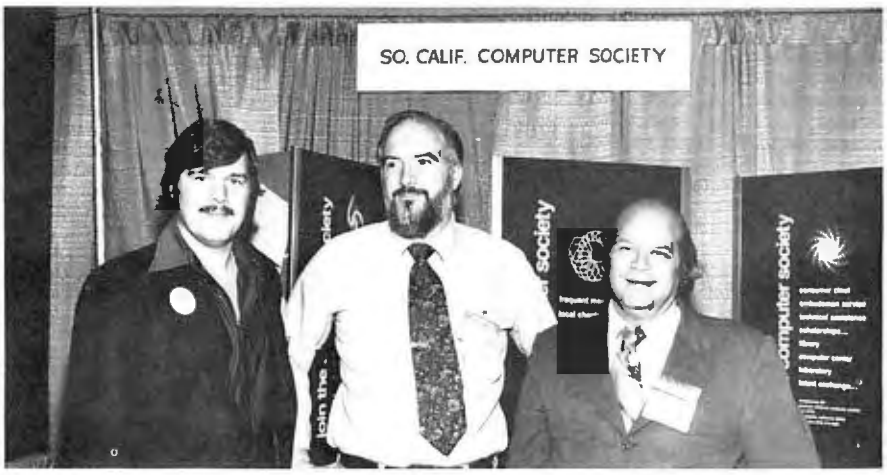
On November 30, 1976, the Southern California Computer Society (SCCS) filed a suit in the Los Angeles County Superior Court against Robert Jones and Robert Jones doing business as McPheters, Wolfe and Jones.

In the suit, SCCS seeks an injunction restraining Jones from alleged unfair competition, compensatory and punitive damages, and an accounting.

The dispute centers around *SCCS Interface* which has been published since mid 1975. SCCS alleges that Jones, who provided SCCS with publishing services from December, 1975 through July, 1976, is engaging in unfair competition in publishing the magazine *Interface Age*.

The unfair competition claim alleges that, among other matters, Jones is using, in *Interface Age*, a name, logotype, format and design improperly similar to those of *SCCS Interface;* is unfairly using the SCCS membership list; and is making improper representation to and threats of lawsuits against various parties.

The suit alleges three causes of action in addition to unfair competion. It seeks an accounting for membership dues and other monies allegedly collected by Jones, seeks the return of personal property and alleged damages for its use, and alleges the conversion of other tangible property.



The people who ran the MINI-MICRO Show in San Francisco were nice enough to give SCCS a booth at the convention and we in turn were nice enough to share it with *Dr. Dobbs' Journal*. Shown at the booth are Lou Fite, SCCS Board Member, Jim Warren, editor of *Dr. Dobbs' Journal* and Lou Fields, SCCS President.

March Meeting at the Personal Computing Show

Because our March 19th meeting coincides with the Personal Computer Show at the L.A. Hyatt House Hotel, we will meet *there* rather than at Orville Wright School. Furthermore, we have arranged for discounts on Personal Computer Show tickets for members who wish to attend. Tickets for two days (March 19 and 20) are $10 at the door or $5 for one day; however, SCCS members who order in advance will pay only $6 or $3. To order tickets, send a check and SASE to Box 54751, L.A., Ca. 90054.

Treasurer Needs Help

Help! The SCCS treasurer is drowning (in paper). Help with clerical work, correspondence, etc. greatly appreciated. Please call Wayne Brady at 980-7343 from 12 noon 'til 6 pm or 395-0866 after 6 pm. Thanx.

A Permanent Meeting Spot

We've spent a lot of time looking for a permanent meeting place. We've spoken to colleges, universities, fraternal organizations, libraries, the parks department and public schools. For small groups, libraries seem ideal but for a large meeting the public school system

Meet the OSI Challenger.

It offers more. It costs less.

No system is more complete. None is less expensive. OSI system boards and full documentation start at $29. Fully assembled systems at $439. Only you govern where they end. And OSI offers more features than ever. Full multiprocessing capabilities. An innovative full color graphics and alphanumeric video system. New options for even greater system expansion. New software. And two of the best-priced floppy disk options you'll ever see. See it all in the OSI catalog. Available now at your computer store or direct from OSI.

☐ Send me the free brochure on OSI kits and fully assembled computers.

☐ Send me the full line OSI catalog. $1.00 is enclosed.

OSI

Ohio Scientific Instruments
Dept. B
11679 Hayden Street Hiram, Ohio 44234
(216) 569-7945

Circle No. 6 on Inquiry Card

looks as if it were made to order.

We found a thoughtful, interested principal at Orville Wright Junior High, near the L.A. Airport. They have a 1080 seat auditorium plus classrooms for meetings and space for vendor displays and swapping. It costs $300 each time we use it but seems like a place we can live with for a long time.

Publication committee

The publication committee is responsible for the editorial and production sides of Interface. Boy do we need help! We need proofreaders, book, article and product reviewers, reporters for chapter and other activities, manuscript referees, authors, help with distribution, etc. Contact Larry Press, box 5429, Santa Monica, CA 90405.

Chapters Committee

The Chapters Committee has a new chairman: Ron Carlson, 14014 Panay Way #255, Marina Del Rey, Ca. 90291 (213) 822-8567. Ron is taking over from Ken Taylor, who was injured in a fall and had to temporarily drop out.

Computer Music Symposium

The February 19th Computer Music Symposium will blow your mind. We plan to have Dr. John Chowning of the Stanford Artificial Intelligence Lab, Dr. Leland Smith, Chairman of the Music Department at Stanford, Dr. Prentiss Knowlton from JPL (SCCS' Music Coordinator), Jim Gordon, William Sinclair, Jerome Wenkel, Ray Jurgens and Dr. Phillip Springer. There will be talks, performances, a high quality quadriphonic sound system and hands on experience. Tickets are $4.00 for SCCS and IEEE members and their guests. Make checks payable to SCCS and send them with a SASE to Box 54751, Los Angeles, Ca. 90054.

Chapter News

Art Armstrong sent us a report on the activities of the Santa Monica Bay Chapter. We can all get ideas for our own chapters by learning what others do and how they are organized. This chapter is totally informal and feels very good.

We urge all chapters and unaffiliated clubs to send us news of what you are doing. How are you organized and what are your activities. Pick someone as a reporter, and also send us pictures of your group in action.

Editor

The Santa Monica Bay Chapter

The Santa Monica Bay SCCS Chapter encompasses an area generally from Palos Verdes on the South to Malibu on the North and as far East as anyone would care to drive.

The meetings are held on the second Tuesday of each month (Feb. 8, March 8) at 7:15 in room 125 of Building 114 on Eisenhower Avenue at the Veterans' Administration facility in West Los Angeles. This is the location of the laboratory of Lou Fields, SCCS President and a member of the chapter.

The structure of the chapter is one of democratic anarchy, there being no dues and no officers, although Ron Carlson is the unofficial presider and filibuster-buster. The agenda of the meetings runs typically to a general interest bull-session, followed by a RAM session and then a break-up into small groups for work on projects brought by members or on more bull-sessions on specific interests.

The December meeting had an attendance of 35 members. Philip Wasson demonstrated his KIM-1 computer with a 1-K text editor driving a selectric printer. Martin Tracy discussed his project, also on a KIM-1, in the Dance Department at UCLA. Martin is working for a PhD in Dance, Kinesiology, and Engineering. He will use his microprocessor for analysis of Electromyography (signals given off by muscle action, detected by skin sensors).

By coincidence, another member was also working on electromyography. Robert Fusfeld, in medical research at the V.A., brought his recently completed IMSAI which he intends to use in his research.

Lloyd Rice also came by with his computalker voice synthesis unit. When he fired it up it was hard to tell whether it was Lloyd or his IMSAI talking. It also did a credible job on John F. Kennedy. Lloyd told us that Computalker will do bird calls and impressions of movie stars on the Ed Sullivan Show next Sunday.

Art Armstrong brought his Compucorps P5P Plotter and several members helped him try to figure out the interface with the aid of an oscilloscope so he can drive it with his Altair. Dave Scott promised that at the January meeting he would show how to use the extra Tarbell I/O ports for joystick inputs. Anyone who is interested is welcome to participate in the Santa Monica Bay Chapter activities. For more specific information call Ron Carlson at (213) 822-8567.

Art Armstrong

Lloyd Rice demonstrating and explaining his voice synthesis unit.

Meetings begin with a group bullsession followed by a RAM session. Then they break up into small groups. Ron Carlson is moderating.

Phillip Wasson and his KIM-1 with a Selectric printer.

Photos by Syd Allen

Ken Young introducing members to the major differences between the 8080 and 6800 MPUs.

Photo by Syd Allen

Dave Scott and Art Armstrong working on Art's plotter.

Lloyd Rice loading data to drive his computalker, voice synthesis unit. Note the custom designed light source on his paper tape reader.

The San Fernando Valley Chapter

We got a call from John Scott, of the San Fernando Valley, CA chapter. John said that they have been featuring talks (and chip set door prizes) by microprocessor manufacturers each month. So far they've had speakers from Intel, Zilog, Motorola and TI. AMD will be there in February.

This chapter is an interesting contrast to the Santa Monica Bay group in that they have officers, planned programs, etc. We will have more on their activities and organization in a future issue.

They meet at 7:00 P.M., the first Wednesday of each month at the Harvard School, 3700 Coldwater Canyon Ave., Studio City. Call (213) 849-7111 for information.

The Pasadena Chapter

We heard from Ed Simmons of the Pasadena Chapter. He told us that they are forming special interest groups for vector graphics and exotic languages and that a group interested in bit-slice machines has already met 4 or 5 times. They are planning a bit-slice project, which we'll describe as soon as we know more.

Their meetings are on the last Tuesday of the month at 7:00 PM at the Pasadena Central Library. Call (213) 681-7047 for information. looks as if it were made to order.

We found a thoughtful, interested principal at Orville Wright Junior High, near the L.A. Airport. They have a 1080 seat auditorium plus classrooms for meetings and space for vendor displays and swapping. It costs $300 each time we use it but seems like a place we can live with for a long time.

MICROPROCESSOR COMPONENTS

CPU'S

8008-1 (18 Pin)	8 Bit CPU (PMOS)	$17.95
8080A (40 Pin)	8 Bit CPU (2us) (NMOS)	24.95

8080 SUPPORT DEVICES

8212	8 BIT I/O Port	$ 4.25
8214	Priority Interupt Control	8.95
8216	Bi-Directional Bus Driver	4.25
8224	Clock Generator	8.00
8255	Programmable Peripheral Interface	12.00

ROM'S

74S387	1024 Bit Programmable	$ 2.50
MM5230	2048 Bit	1.95
DM8796	4096 Bit	10.00

PROM'S

82S23	32 x 8 Open Collector (Schottky)	$ 3.00
1702 A	2048 Bit (512 x 4) (1us) Erasable and Electrically Reprogrammable	5.00
1702AL	2048 Bit (512 x 4) (LO-PWR) (1us) Erasable and Electrically Reprogrammable	7.00
2708	8192 Bit (1024 x 8) Erasable and Electrically Reprogrammable	40.00
8223	32 x 8 Open Collector	3.50

SHIFT REGISTER'S

MM506N	Dual 100 Static	$ .89
P-2405	1024 Dynamic	4.95
N2518B	Hex 32 Bit	3.95
N2533V	1024 Static	3.95
MM5013N	1024 Bit Accumulator Dynamic	2.00
MM5017N	Dual 500/512 Dynamic	2.00
MM5058	1024 x 1 Static	2.50
TMS3002LR	Dual 50 Static	3.00
TMS3132NC	Dual 144 Static	2.00

CALCULATOR CHIPS

MM5736	6 Digit Cal.	$1.25
CT5001	12 Digit Cal.	1.75

With Specifications

RAM'S

21L02	1024 x 1 Static	$1.58
1101	256 x 1 Static	1.00
1103	1024 x 1 Dynamic	1.50
2101	256 x 1 Static (1us)	3.00
2102	1024 x 1 Static (1us)	1.50
2102-1	1024 x 1 Static (500NS)	1.65
2107B	4096 x 1 Dynamic (200NS)	6.50
2107B-4	4096 x 1 Dynamic (270NS)	5.00
2107B-6	4096 x 1 Dynamic (350NS)	4.50
3107	256 x 1 Static (80NS)	2.95
3107A	256 x 1 Static (60NS)	3.50
4050NL	4096 x 1 Dynamic (300NS)	4.00
5261	1024 x 1 Dynamic (400NS)	3.00
5262	2048 x 1 Dynamic (365NS)	3.00
5280	4096 x 1 Dynamic (200NS)	4.00
7489	16 x 4 Static	1.50
8599	16 x 4 Static	1.50

MISC. OTHER COMPONENTS

N8T20	Bi-Directional One Shot	$4.00
N8T26	Quad Bus Driver/Receiver	3.25
N8T97	Tri-State Hex Buffer	1.45
1488	RS232 Quad Line Driver	1.25
1489	RS232 Quad Line Receiver	1.25
D3207A	Quad Bi-Polor to MOS Level Shifter/Driver	2.50
C-3404	6 Bit Latch 12NS Output Delay	3.95
P-3408A	Hex Sense Amplifier W/Latch	6.75
P-4201	Clock Generator	4.95
MM-5320	T.V. Camera Sync. Generator	6.00
MM-5369	Oscillator Pre-scaler	2.00
MC-6850L	Asynchronous	
DM8130N	Ten Bit Comparator	2.25
DM8131N	6 Bit Comparator	2.00

DISPLAY LED'S

Type	*Polarity*	*HGT.*	*Price*
MAN-4	Common Cathode	.187	$ .75
ILD-74	Logic Drive	(8 Pin)	
	Opto-Isolator	(8 Pin)	1.00
DL-707	Common Anode	.300	1.25
DL-747	Common Anode (Jumbo)	.60	2.00
TIL-113	Opto Coupler	(6 Pin)	2.00
TIL-302	Common Anode (LORR DEC)	.27	1.00

TTL PRODUCT

7400	.14	7441	.85	7496	.65	74160	.86
7401	.20	7442	.44	7497	2.00	74161	.62
7402	.20	7443	1.20	74100	1.25	74162	1.00
7403	.20	7445	.89	74107	.76	74163	.76
7404	.20	7446	.87	74109	.35	74164	.80
7405	.20	7447	.69	74110	.50	74165	.90
7406	.39	7448	.81	74116	2.00	74166	1.00
7407	.39	7450	.20	74120	1.25	74167	3.00
7408	.20	7451	.20	74121	.34	74170	2.00
7409	.24	7453	.20	74122	.39	74172	9.72
7410	.20	7454	.20	74123	.50	74173	1.25
7411	.20	7460	.20	74125	.45	74174	.85
7412	.24	7470	.20	74126	.45	74175	.75
7413	.35	7472	.23	74128	.65	74176	.85
7414	.70	7473	.26	74132	.95	74177	.85
7416	.33	7474	.29	74136	.50	74180	.75
7417	.33	7475	.39	74141	.80	74181	2.00
7420	.20	7476	.31	74142	4.00	74182	.90
7422	.50	7479	1.50	74143	3.00	74184	1.65
7423	.28	7480	.69	74144	4.00	74185	1.30
7425	.24	7482	.72	74145	.70	74186	5.00
7426	.24	7483	.75	74147	2.50	74190	1.00
7427	.24	7485	.90	74148	1.75	74191	.65
7428	.40	7486	.25	74150	1.00	74192	.85
7429	.40	7488	3.50	74151	.70	74193	.85
7430	.20	7489	1.50	74153	.70	74194	1.20
7432	.28	7490	.39	74154	.90	74195	.55
7433	.34	7491	.65	74155	.70	74196	.80
7437	.28	7492	.39	74156	.90	74198	1.50
7438	.28	7493	.39	74157	.70	74199	1.75
7439	.36	7494	.70	74158	1.75	74200	3.50
7440	.20	7495	.50	74159	2.25	74279	1.75

LINEAR

LM308N(8)	Micro Power Op Amp	$ .75
LM311N(8)	Hi-Performance Volt. Comp.	.95
LM318N(8)	Precision Hi-Speed Op Amp	1.95
LM324N	Quad 741 Op Amp	1.00
LM339N	Quad Comparator	.75
LM380N	2 Watt Audio Power Amp	.60
LM381N	Low Noise Power Amp	1.95
NE555V	Timer	.60
NE566V	Function Generator	2.00
NE567V	Tone Generator	2.00
NE723CN	Voltage Regulator	.50
NE739N	Dual Hi-Perf. Op Amp	1.00
NE741CH	Compensated Op Amp	.45
NE741CN	Compensated Op Amp	.35
NE1458CN	Dual Comp Op Amp	.65
NE3900N	Quad Amp	.45

BANKAMERICARD

JADE Co

master charge

ELECTRONICS DISTRIBUTION

NEW LOCATION

5351 W. 144th ST., LAWNDALE, CA 90260

TERMS:

Add $1.00 for shipping plus $.85 if COD
California Residents add 6% Sales Tax
$20 minimum on BofA & M.C.
Orders from Foreign countries add appropriate postage

Phone (213) 679-3313

Retail Store Opens February 21, 1977
Hrs. 9-7 MON.-FRI.; 9-5 SAT.; 12-5 SUN.

Circle No. 7 on Inquiry Card

UPdate

Short contributions of fact and opinion

Fixes to Last Months Interface

A coordination mixup resulted in our leaving adds for *Ohio Scientific* and *A-VID Electronics* out of the magazine. Our apologies to A-VID and Ohio Scientific and, again, our thanks to them and all of the advertisers who helped us re-bootstrap Interface.

We also heard from Ed Faber, President of Computer Shack, that, after we interviewed him it was decided that IMSAI would continue to service their distributors and OEM dealers and Computer Shack would only operate the franchise chain.

We ran one Update item twice (it's up to you to discover which one) and spelled Alan Turing's name "Turning". We won't mention any other typos, but if you are interested in helping with proofreading, get in touch.

HD Altair Transformers

For members of SCCS only

The replacement power transformer for the original Altair 8800 is available again. It has primary taps at 110 and 120 volts, and it can supply 8 v.d.c. at 20 amps as well as plus *and* minus 16 v.d.c. at 2 amps each, so it will replace all the transformers of the original Altair. This is the same transformer that was available through Group Purchase last year, and it will be available from them again when they restart operations.

In the meantime, you can get yours by sending $25.00 plus shipping charges for 10 lbs. to:
Rudy Hirschmann
1001 Kagawa St.
Pacific Palisades, CA 90272
Make your check payable to Rudy Hirschmann and be sure to include your membership number (see the mailing label on your *SCCS Interface*). Delivery is 4-10 weeks.

If you are not yet a member but still want a transformer, follow the instructions above *and also* fill out a membership application card from the back of the magazine and include it with your order and a *separate* check for $10.00 *payable to SCCS.*

Article Wanted

Someone should write a survey article on all of the PROM monitors coming out – compare them, look at features, and suggest necessary features. I've seen MITS 680, Digital Group and Pacer. 680 is minimal, Digital Group is neat. Pacer is super neat. What else?

Loss of Innocence

A year or two ago, when the hobby computer burst upon the scene it generated a Movement which really felt good. It was nice and innocent and enthusiastic and idealistic; sort of like the Hippy Movement of the mid 1960's or the Children's Crusades of the early 1200's.

I just heard from a friend that some obviously very knowledgeable thieves had broken into his home workshop and stolen thousands of dollars worth of hardware and software. A Byte Shop in Northern California was robbed of over $20,000 in merchandise recently. I just read an editorial in a club newsletter (New Jersey) saying that all of the high-energy volunteers had dropped away. A lot of people seem to be out to profit more than to learn and have fun.

Hey, have we already lost our innocence? I sure hope not. Lets remember and retain our sense of play and cooperation!
Righteous Randy
Lafayette Cafe
Venice, California.

A Taxonomy of Computer Science

The ACM, a professional computing association with fairly academic roots use the following scheme to classify computing articles (reprinted with permission):

1. General Topics and Education
- 1.0 General
- 1.1 Texts; Handbooks
- 1.2 History; Biographies
- 1.3 Introductory and Survey Articles
- 1.4 Glossaries
- 1.5 Education
- 1.9 Miscellaneous

2. Computing Milieu
- 2.0 General
- 2.1 Philosophical and Social Implications
- 2.2 Professional Aspects
- 2.3 Legislation; Regulations
- 2.4 Administration of Computing Centers
- 2.9 Miscellaneous

3. Applications
- 3.0 General
- 3.1 Natural Sciences
- 3.2 Engineering
- 3.3 Social and Behavioural Sciences
- 3.4 Humanities
- 3.5 Management Data Processing
- 3.6 Artificial Intelligence
- 3.7 Information Retrieval
- 3.8 Real Time Systems
- 3.9 Miscellaneous

4. Software
- 4.0 General
- 4.1 Processors
- 4.2 Programming Languages
- 4.3 Supervisory Systems
- 4.4 Utility Programs
- 4.5 Patents, Software
- 4.6 Software evaluation, Tests and Measurement
- 4.9 Miscellaneous

5. Mathematics of Computation
- 5.0 General
- 5.1 Numerical Analysis
- 5.2 Metatheory
- 5.3 Combinatorial & Discrete Mathematics
- 5.4 Mathematical Programming
- 5.5 Mathematical Statistics; Probability
- 5.6 Information Theory
- 5.7 Symbolic Algebraic Computation
- 5.9 Miscellaneous

6. Hardware
- 6.0 General
- 6.1 Logical Design, Switching Theory
- 6.2 Components and Circuits
- 6.4 Patents, Hardware
- 6.9 Miscellaneous

7. Analog Computers
- 7.0 General
- 7.1 Applications
- 7.2 Design; Construction
- 7.3 Hybrid Systems
- 7.4 Programming; Techniques
- 7.9 Miscellaneous

8. Functions
- 8.0 General
- 8.1 Simulation and Modeling
- 8.2 Graphics
- 8.3 Operations Research Decision Tables
- 8.9 Miscellaneous

We thought that this list might lend some perspective as to where we fit in. Bear in mind that these categories really indicate what computer people do, and don't necessarily define the essence or scope of Computer Science.
Jim Carlstedt
Jim Levin

Call for Papers & Participation: Personal Computers for Education

The "Personal Computers for Education" Section of the First West Coast Computer Faire, to be held in San Francisco on April 15-17, 1977, appears likely to be one of the largest Conference Sections of the entire convention. This Section is expected to include two full days of papers, panel sessions, and tutorials. These will present ideas, information, and experiences concerning the use of these very low-cost, general-purpose digital computers for educational activities.

Those wishing to present papers, conduct tutorials, participate in or organize panel sessions, or offer suggestions concerning Personal Computers for Education should contact:
Marvin Winzenread
3360 Tonga Lane
Alameda, CA 94501
(415) 521-2119; 881-3400 or
Don Inman
350 Nelson Road
Scotts Valley, CA 95066
(408) 335-3360; (415) 323-3111

The following are some of the topics expected to be included in this Conference Section, and for which papers are being actively solicited:
- Choosing very low-cost computer equipment for use in the classroom
- Computer-based games and simulations of particular educational value
- Educational uses of computer-driven television and graphics displays
- Uses of computers in teaching numeration systems, and Boolean arithmetic & algebra
- Use of low-cost computer speech synthesis and video output for pre-readers
- Uses of computers to maximize conceptual learning while minimizing drudgery
- Facilities for individualized computer-aided instruction (CAI) on very low-cost computers
- Uses of personal computers & computer kits in science and vocational classes
- Experiences with using personal computers and computer kits in the classroom
- Educational uses of computers in the home

and so on. Note that this Conference Section is not expected to be concerned with: data processing for education, educational time-sharing systems, nor uses of expensive computers in education.

There will be a professional credit course offered through the University of California, associated with the Personal Computers for Education Conference Section. It will include six hours of pre-conference tutorials and a post-conference summation and report, as well as attendance at specified Conference Sessions. Options for the pre- and post-conference meetings will make it convenient for local residents to attend them in several evenings, while also allowing participants coming from greater distances to complete attendance during the three-day weekend.

Symposium on the Search for Extraterrestrial Intelligence

"Who are We?" "How did we get here?" "Are we alone in the Universe?" The answers to these questions have broad scientific implication as well as deep philosophical, sociological and theological meaning. The Search for Extraterrestrial Intellignece (SETI) has begun...

The Forum for the Advancement of Students in Science and Technology (FASST), and the student programs division of the American Institute of Aeronautics and Astronautics (AIAA) invite you to take part in the search by participating in a special symposium, "THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI)" to be held at the Ames Research Center, near San Francisco, *February 24-25, 1977.*

Conference speakers and special discussion groups will highlight the symposium dedicated to learning current technological approaches for locating extraterrestrial civilizations and evaluating possible ramifications of discovering and contacting extraterrestrial intelligences upon Earthkind.

The program will involve the following topics: The Cosmic Picture: Is anyone really out there?; The Origin of Life: Chemical and Biological considerations; Evolution of Technological Civilizations; The Search Begins: Methods and Technology needed; and Cultural Implications of Detection and Contact

with Extraterrestrial Intelligences.

Directed primarily toward college and university students, the symposium welcomes participation by interested professionals and faculty. A wide cross section of disciplines will be involved, i.e., anthropology, theology, life science, engineering, sociology, physics and astronomy.

Registration fee is $10.00. This fee includes tour, symposium materials, and special banquet with guest speaker.

For further information, contact: FASST/SETI, 1785 Massachusetts Avenue, N.W., Washington, D.C. 20036. Phone: (202) 483-2900 or the Ames Center (415) 965-5543.

Theater Computer Users' Group

Support of a Theater Computer Users Group is being considered by Theater Sources, Inc., a non-profit, tax-exempt corporation. Persons who have developed programs for applications in the area of live drama are invited to contact TSI with suggestions, information, and requests to be placed on a preliminary mailing list. Write TSI-TCUG, 4712 Northway Dr., Dallas, TX 75206.

The form of support has not been set, but may include a newsletter, reproduction of listings or decks on file and/or meetings for exchange of information. Suggestions are welcomed. Costs of services will be covered by modest fees.

Uses of the computer in theater might include rather ordinary uses such as bookkeeping, accounting, and mailing lists, but can also be extended to ticket sales, seating charts, budgeting and artist records. Further extensions might include creation of buying and cutting lists for sets and costumes, visualization and modification of designs, and other interactions between artists and machine to ease the tedium of craft.

Theater Sources, Inc., is a non-profit corporation under Texas law, created to "gather and distribute information about live theater" and granted a federal tax exemption. Its current activities include publication of PROLOG, a newsletter for playwrights, and THEATER ACROSS AMERICA, for community theater, and the National Theater File, timeshare access to theater information.

Contact: Mike Firth, (214) 363-5003, 4712 Northway Dr., Dallas, TX 75206.

Monitor Pinpoints Chip Failures

We met Dr. Robert Suding of the Digital Group recently and saw a demonstration of their computer. The system is nicely packaged—the computer in a cabinet along with a keyboard, a video monitor and a cassette. There are two switches on the front panel: on/off and reset. That's enough if you have a monitor and debugging system, which Digital Group has.

We've read in their flyers how easy it is to switch CPU's by plugging in a new board, turning on power and loading a cassette—and it's true. It takes 30 seconds to switch from Z-80 to 8080 or 6800 or 6500. That's neat to see, even if you've read about it. We loved it when Suding bent a pin out on a memory chip and the monitor displayed the message "BOARD 1, IC44 IS BAD" when the system was loaded.

A New Journal of Computer Music

The *Computer Music Journal* will be devoted to the development of computer systems which are capable of producing high quality music. The following topics will be covered:

- production of natural sounding timbre or quality of tone by Fourier like synthesis (with up to 128 ultra low distortion sine waves from one digital oscillator), FM synthesis, and new methods
- design of real time playing instruments
- real time controllers such as organ like keyboards, joysticks, pressure sensitive pads, and new designs
- circuit design of microprocessor or minicomputer controlled digital oscillators (any waveshape)
- high speed multiplication (16 bit X 16 bit→16 bit product in less than 200 ns)
- review of hardware components
- composition of music using a computer
- music theory which would be more easily realized with a computer than with traditional instruments
- homebrew digital music instruments
- choral effects
- digital filtering
- envelope generation of any shape
- digital reverberation and movement of spacial location with Doppler shifting
- high resolution, high speed digital to analog converters
- analysis of acoustic instruments
- psychoacoustics
- reviews of books

The first issue of the journal will be about 50 pages in length. If enough people subscribe to pay for printing a larger journal, the journal will increase in size. A one year subscription will cost $14 and be published on a non-profit basis by PCC. The journal will be published every other month, and first issue will be mailed out during January, 1977. If interested contact John Snell at PCC, Box E, Menlo Park, Ca. 94025.

Ed. Note:

We know John Snell and his heart and head are both in good places. This will be a high quality, fairly priced journal.

Buster II—The Robot

The Amateur Computer Group of New Jersey is running a 3 part description of a neat computer controlled robot project in their newsletter. The robot, called Buster II, was built by 14 year old Tod Loofbourrow. *Continued to Page 54*

Book Review

"8080 Programming for Logic Design"

by Adam Osborne
Osborne and Associates
P.O. Box 2036
Berkeley, Ca. 94702
$7.50
(195 pages)

This is the latest in the series of books from Osborne and Associates. It deals with the use of microprocessors in place of combinitorial logic. The book assumes basic familiarity with the 8080 microprocessor (at the level of Osbornes first book *"An Introduction to Microprocessors"*). It begins with illustrations of the 8080 as used to simulate various chips (inverters, gates, flip-flops and monostable multivibrators).

The majority of the book deals with an extended example of a microprocessor application: a portion of an interface for a printer. One chapter presents the interface in digital logic in sufficient detail to meet the needs of a programmer with no logic background, and then emulates this design on a device by device basis using a microprocessor. The next chapter implements the interface as a single unit as if combinitorial logic did not exist. The next chapter "cleans up" the resultant program, improving program efficiency. An 8080 instruction set chapter and one on commonly used subroutines conclude the book.

As microprocessors become cheap, logic designers must become programmers and as electronics become simple (more highly integrated), programmers may become logic designers. This book is of interest to people trying to make the transition in either direction.

"The 1975 Computer Chess Championship"

by David Levy
$3.75
Computer Science Press
4566 Poe Ave.
Woodland Hills, Ca.
Review by Zane Thomas

The 1975 COMPUTER CHESS CHAMPIONSHIP (Computer Science Press) by International Chess Master David Levy is everything that a tournament book should be, and then some. Its contents include a move-by-move record of every game played in the tournament, brief chapters dealing with the history and fundamentals of computer played chess, and a record of the games played by Levy against each of the tournament competitors. Although Levy's game annotations are somewhat sparse, they are excellent and clearly demonstrate both the strengths and weaknesses of current chess playing programs. One game from the tournament, played between CHAOS & CHESS 4.4, is considered by Levy to be the best game of chess ever played by computers. For that game he provides, in addition to lucid and rather extensive annotations, the following information on each of CHESS 4.4's moves: the CPU time, the number of positions examined, the programs assessment of the present position, and the predicted sequence of moves. For anyone who is interested in computer chess the *"1975 Computer Chess Championship"* is a must; and for anyone who scoffs at the idea of a computer playing a challenging game of chess, it could provide a rude awakening.

"My Friend the Computer"
by Jean Rice
Denison & Co.
5100 West 82nd St.
Minneapolis, Minn. 55437
Review by Jim Hoffner, Instructional Coordinator, T.I.E.S.

"My Friend The Computer" by Jean Rice is an outstanding introductory computer literacy book not only for the classroom but for teacher training. Used with an excellent teacher manual and accompanying computer programs (quizes on the various book chapters), TIES Instructional Services summer workshop was a smashing success in terms of generating interest and enthusiasm. TIES Instructional Services highly recommends the use of this material for everyone considering an introductory overview to "My Friend The Computer."

Soldering

Ron Carlson showed us a copy of "Soldering Electrical Connections", NASA publication SP-5002, available from the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402, Stock #003-000-00246-7, Cct # NASI-21:5002/2.

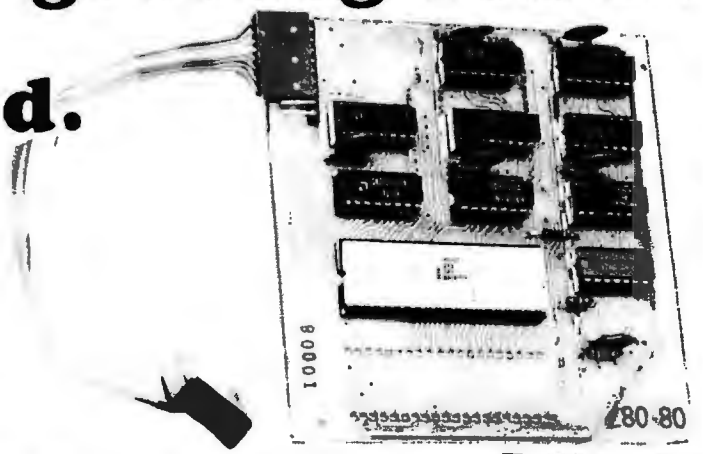
It is the ultimate in super-soldering handbooks, written for the person soldering components for space craft, who might be a little more careful than the run-of-the-mill hobbyist. It has good tips, all sorts of tools which you probably don't have, and greatly enlarged pictures of the sorts of mistakes you can make.

Chips

Did you know that Computer Magazine, IEEE Computer Society, 5855 Naples Plaza, Suite 301, Long Beach, Ca. 90803 publishes a monthly list of new IC announcements, giving date, manufacturer, family, price, function and comments on each?

NOW!!

Z-80 Power for the S-100 bus without getting rid of your CPU card.



$159.95

assembled

DUTRONICS® *a leader in low cost, low power ram boards has just announced it's* Z 80 – 80 *piggy back card. This plug – in board enables you to use your existing IMSAL, ALTAIR CPU card and upgrade your system to a Z – 80.*

The card design is such that all you do is pull out your 8080 and 8212 chips, plug in the Board to the 8080 socket itself and the ribbon cable to the 8212.

A system monitor, on paper tape, is included with the board as well as a 280 Manual and Theory of Operation Manual.

Dutronics will also supply all additional software at no cost, when it becomes available
The price is $159.95 (assembled) only. OFF THE SHELF.

BYTE OF PHILADELPHIA
1345 W. Lancaster Ave.
Bryn Mawr, Penn. 19010
(215) 525–7712

BYTE OF PALO ALTO
2227 El Camino
Palo Alto, Ca. 94306
(415) 327–8080

BYTE OF SAN MATEO
1200 W. Hillsdale Blvd.
San Mateo, Ca. 94403
(415) 341–4200

BYTE OF WESTMINSTER
14300 Beach Blvd.
Westminster, Ca. 92683
(714) 894–9131

BYTE OF SANTA CLARA
3400 El Camino Real
Santa Clara, Ca. 95051
(408) 249–4221

for more information call or write to:

R.H.S. MARKETING

2233 El Camino Real
Palo Alto, California 94306
(415) 321–6639

DEALER INQUIRES INVITED

B of A & MASTERCHARGE ACCEPTED

Circle No. 8 on Inquiry Card

The Byte Shop reaches a new low in microcomputers. $349

The Byt-8. It doesn't have a nifty (and expensive) front panel with lots of LED's and toggle switches.

And we obviously don't have a big full-color ad.

What we do have is the lowest priced microcomputer you can buy—built around the powerful and popular 8080A microprocessor.

For $349, you get the complete microcomputer card, motherboard, power supply and chassis in kit form.

The Byt-8 S100 bus is the same one used by Altair, IMSAI and most others so you have the greatest possible flexibility in choosing memory and input/output cards.

Optional cards from the Byte Shop include 4k, 8k or 16k of Random Access Memory, 4k or 8k of Programmable Read-Only Memory, a multiple input/output card, a TV typewriter card and, yes, a front panel bootstrap card, if you want the LED's and switches.

Even the CPU is optional. We'll sell you the chassis, motherboard and power supply for $229, and you can choose your own microcomputer card—a ZPU for instance?

Byt-8. It's the new low in price, but we're aiming for a new high in flexibility, delivery and support. See the Byt-8 at your nearest Byte Shop.

BYTE SHOP™
the affordable computer store

Stores now open in: **Arizona,** Tempe; **California,** Berkeley, Campbell, Fresno, Hayward, Mountain View, Palo Alto, Pasadena, Sacramento, San Jose, San Mateo, San Rafael, Santa Barbara, Santa Clara, Santa Cruz, Tarzana, Thousand Oaks, Walnut Creek, Westminster; **Colorado,** Boulder, Englewood; **Minnesota,** Minneapolis/St. Paul; **New York,** Levittown; **Oregon,** Portland; **Pennsylvania,** Bryn Mawr; **South Carolina,** Columbia. If there's no Byte Shop near you yet, please write to Byte Inc., 1450 Koll Circle, Suite 105, San Jose, California 95112 for information on our Byt-8 system.

APPLICATIONS EXCHANGE

By Larry Press

COORDINATORS

Wouldn't you like to be a happy-go-lucky coordinator?

Secondary Schools:
Art Armstrong,
3345 Moore St.,
Los Angeles, CA 90066
(213) 397-3847

Commodity and stock price prediction:
Mary Stevens,
11745 Montana Ave., #110,
Los Angeles, CA 90049
(213) 472-1098

Programs for small children:
Joanne Verplank,
1919 Menalto Ave.,
Menlo Park, CA 94025

Statistical applications:
Barry Gerber,
Dept. of Political Science,
CSU Fullerton
Fullerton, CA 92634
(714) 993-1567

Computer graphics:
John de Longpre,
11464 Bailey Dr.,
Lowell, MI 49331
(616) 897-5822

Power supplies:
Fred Schultz,
3734 W. Slauson,
Los Angeles, CA 90043
(213) 299-4439

Medical applications:
Lou Fields,
11662 Sunset Blvd.,
Los Angeles, CA 90049
(213) 272-0942

Biofeedback:
Larry Press,
1702 Ashland,
Santa Monica, CA 90405
(213) 396-0048

Biorythms:
Art Childs,
335 N. Adams, #210,
Glendale, CA 91206
(213) 243-5179

Electronic music:
Prentiss Knowlton,
255 N. Madison Ave.,
Pasadena, CA 91101
(213) 449-6034
Suite #4,

Voice synthesis:
D. Lloyd Rice,
821 Pacific, #4,
Santa Monica, CA 90405
(213) 392-5230 (hm),
(213) 825-2773 (bus)

Games:
George Tate,
3544 Dahlia Ave.,
Los Angeles, CA 90026
(213) 663-2604

Astrology and ESP:
Al Manning,
ESP Laboratory,
7559 Santa Monica Blvd.,
Los Angeles, CA 90046
(213) 876-9984

Mark-8 hardware, corrections, add-ons, and software:
Ronald Carlson,
14014 Panay, #255,
Marina del Rey, CA 90291

Power Supplies

Fred Schultz is our coordinator for power supplies. Fred has been fooling around with a soldering iron since he built the first TV set on his block at the age of 13. For the last twenty years, he has been designing and making power supplies professionally. His most recent power supply product is a complete uninterruptable power system which is bus compatible with the Altair. It will keep an 8k Altair up and running for thirty minutes with no glitches in the event of an AC power failure. This product is in the pre-production stage, but Fred's "buffer in", a buffer module for the CPU/front-panel interface on an Altair or IMSAI is now on the market.

Medical Applications

Lou Fields has volunteered to be our coordinator for the medical applications area. Lou is interested in both research and therapeutic applications. He has a very heavy background in the area of biomedical instrumentation. During his twenty six year instrumentation career, Lou has done pioneering work in designing patient monitoring systems for intensive care units of hospitals, medical flight packages for space missions (Russian and American), EEG recording and analysis equipment, etc. A list of his interests and inventions would fill a page!

Graphics Applications

John de Longpre will coordinate graphics applications. John is currently working on a completely programmable spacewar system comparable to the large computer based game at MIT. He worked as a teleprocessing and systems programmer on the IBM 370/145 for a few years and is now a programmer analyst for the West Michigan Regional Planning Commission.

Schools

I have received all sorts of interesting material on computing in schools from Jean Rice. Jean teaches a community college course called "Do Not Bend Spindle or Mutilate" and has had extensive experience working with grade school kids in Edina, Minnesota.

If you are thinking of doing something at the grammar school level, I would suggest dropping Jean a line and asking for a copy of the report on her project in the Edina Elementary Schools. She worked with fifth graders:

The class was organized around Jean's textbook *My Friend the Computer* which is written in a non-threatening style and covers what computers are, applications, history and programming. The table of contents is not unusual, but the low key presentation and the instructors guide, which is chock full of pre-printed ditto masters and overhead transparencies ready to use in the classroom, are unique. Jean's address is: 5132 Tifton Dr., Edina, Minn. 55435 and her publisher is: T.S. Denison & Co., 5100 West 82nd St., Minneapolis, Minn. 55437. If you write Jean for her report, it would be nice to send an 8 1/2 x 11 self-addressed stamped envelope with about 23¢ postage.

I also heard from Al Stampfly of the Coloma Michigan Community Schools. He writes that he has converted several of the Social Science simulations in the Huntington Library to IMSAI extended BASIC with little difficulty, and is willing to share his experience. See his letter in the Letters to The Editor department.

Letters

Who Got Which Checks?
Dear Mr. Press:

Pursuant to a telephone conversation I had with you in late October, enclosed please find copies of my cancelled check #211 dated July 1, 1976 for $10.00 to SCCS Interface for a one year membership and subscription to Interface Magazine.

In that conversation you said that you would be sending me a letter, which I never received. I have however, received the September and October issue of Interface Age but have not received a November issue.

It has been four months since my check was cashed and still I have not received regular issues of Interface Age. I am out $10.00 and have no product to show for it.

Timothy D. Sisson
1800 Wayne St. #1
Bellevue, Nebraska 68005

If you examine the endorsement on your check to us, you will see that it was cashed by our ex-publishing service, McPheters, Wolfe and Jones, not by SCCS.

You didn't receive our letter because your name is not on our mailing list, since your check was cashed by M.W. & J.

M.W. & J. publish Interface Age, and if you are not getting it or if you thought that you were joining SCCS when you sent us a check, you should let them know.

I am truly sorry about this mixup —your case is not isolated.

Larry

Help and Encouragement for Group Purchase
Dear Sir:

Sorry to hear that something has gone wrong with SCCS Group Purchase. I, for one, would do *anything* to see it reinstated. Perhaps 3% was not sufficient for profit to stay in business.

I would be happy to send in a couple of dollars—and if every member were to do the same—you could recover the $9,000 and more —to refund 100% of what the members have in Group Purchase.

And then, perhaps, start the Group Purchase program again!! Put it to a vote—the members contribute the price of an 8224—they'll save more than that on their first order.

Joseph C. Kish 1720-00
758 Yucca Ridge Lane
San Marcos, CA 92069

Joseph didn't mention it in his letter, but a $5 contribution was also included. This sort of gesture is what keeps the die hard volunteers who try to run things like Group Purchase going. Thank you

Larry

An IMSAI in a School
Dear Larry:

I read your request in the September issue of *Interface* for anyone working on converting the Huntington educational simulation programs to MITS Basic. The Coloma School System has just purchased an IMSAI 8080 with 32K of memory and has a TV terminal with a VDM-1 driver and a TI keyboard. We are loading our extended basic from cassette tape but have on order a dual floppy disc system and a 300 1pm printer. We hope to eventually expand to a complete multiuser system and as part of that have many of the Huntington simulation programs on the system, especially Physics, Chemistry, Math, Business and Social Studies. We converted a couple Social Studies programs, but until we get our disc storage system we haven't any way to keep the programs except by making pencil changes to their listings.

Actually we have found the two we have running in extended basic quite easy to change and do not foresee too many complications in translating others. We, of course, would be willing to exchange anything we translate, and I would also like to know if anyone else is using a full system such as we are contemplating. We eventually, next year, would like to use the microcomputer to teach extended basic to students and some assemblers.

Al Stampfly
Director of Data Processing
Coloma, Michigan 49038

Suggestions
Hi,

The old *Interface* rarely, if ever, covered SCCS Group Purchase offerings and virtually never published the Group Purchase address. Those of us who can't make it to L.A. would benefit from a little coverage of this.

I'd also like to see PROM programmer designs and a column devoted to general programming techniques such as arithmetic algorithms.

Arthur N. Hicks II
Box 642
La Jolla, California 92038

We hear your suggestions. Would you be interested in writing or editing the column? article?

Larry

Low Cost Graphing

By Art Armstrong

This article documents the graph drawing program which Art Armstrong uses in his math classes at Venice (California) High School. The user specifies a function and the location of the origin on the display, and the program plots it on a video monitor.

Several years ago, I installed a time sharing terminal in the public library in my community. Naturally, students from the high school began to come around, and I began to hear about this fantastic math teacher, Mr. Armstrong. Since then I've gotten to know Art Armstrong, and can understand his students' enthusiasm—he is a dedicated, innovative teacher. Art has used time sharing and an HP calculator-plotter for years. He is the first teacher I know of to have used an Altair in the classroom and the first to have students assemble Altairs in the classroom.

Art is more than an equipment freak. He is the sort of teacher whom students come back to visit years after graduation. His classroom is open and active and he is one of the few public school teachers I know who is around after school hours. Art has been very active in SCCS and is a member of the board of directors.

Art Armstrong
may be reached at:
3345 Moore St.
Los Angeles, CA 90066
(213) 397-3847

Probably every math teacher and every math student has longed at some time for a device which would produce graphs of functions in response to mathematical statements. About ten years ago analog plotters were placed on the market by calculator manufacturers such as Monroe and Hewlett Packard. These produced graphs by drawing short straight line segments approximating the curve. They were dramatic to watch and useful in application but were expensive and required using the rather cumbersome language of the driving programmable calculator.

About five years ago Hewlett Packard and Wang produced plotters which were driven by BASIC-speaking calculators. These were straight-forward to use and produced excellent graphs, but the prices were in the neighborhood of $8000 (with calculator).

Recently, Tektronix has offered a CRT vector graphics unit which is fast, has a large capacity for data, speaks BASIC, and has a hard copy option. Unfortunately the price, around $7500, while representing a leap in cost-effectiveness over the previous plotters, is still out of reach of most of us.

Having the Polymorphics Video Display plugged into a computer using the S-100 buss (Altair, IMSAI, Polymorphic, Cromemco) is affordable. Video display units allow graphics capability while also serving as input-output devices. Graphics on the unit, using a POKE version of BASIC, is fairly fast and the expression of mathematical statements in BASIC is direct and familiar.

The only disadvantage of the video board, from a graphics standpoint, is that the resolution is low. The Polymorphics board offers 128 horizontal and 48 vertical units in graphics mode. This is better than that offered by the teletype, which has traditionally been used

Art Armstrong and Mona Lisa, both smiling.

Photo by Larry Press

in math programs for graphing, but it lacks the accuracy and continuity of the Tektronix units.

However, one takes what one can get. The Polymorphics board is available, affordable, and easy to use.

The program described below has been used by the author in a high school classroom to help students gain a better understanding of the relation between an equation and its graph. Even with the low resolution, students can learn much about the behavior of functions in a dramatic, dynamic, and responsive manner. Questions which cannot be resolved with the unit, such as continuity, roots, intersections, and asymptotes can be left for other analysis where necessary.

```
1 REM POLY-PLOT 12/10/76
2 REMBY ART ARMSTRONG
3 REM COPYRIGHT SCCS INTERFACE
10 SA=31744:REM SA IS THE STARTING ADDRESS OF THE POLYMORPHIC BOARD.
15 RO=9:REM ORIGIN ROW
16 CO=32:REM ORIGIN COL.
20 AR=3*RO-2
21 AC=2*CO-1
100 DIM M(3,2)
110 B=SA-65
115 AX=B+576:AY=B+32
120 WN=1:TW=2:TH=3:S4=64
122 TY=20:F6=56:F8=48:F5=15:T4=24
123 T6=36
126 YC=2.99
127 ZR=0:P5=.5:F4=4:SX=16:FV=5
130 W3=1/3:W6=1/6
135 BG=0
140 FORX=1TO3:FORY=1TO2:READM(X,Y):NEXTY,X
150 DATA32,4,16,2,8,1
160 C=32
190 REM  CLEAR SCREEN
200 FORX=B+65TOB+1088:POKEX,BG:NEXT
490 REM  DRAW X-AXIS.
500 FORX=1TOS4
510 AD=S4*RO+X+B
520 POKEAD,T6
530 NEXT
535 REM  DRAW Y-AXIS.
540 FORY=ZRTOF5
550 AD=CO+S4*Y+SA-1
560 POKEAD,F6
570 NEXT
590 REM  ADD 5 UNIT TICS ON X-AXIS.
600 L=CO-F5*INT(CO/F5)
610 R=CO+F5*INT((S4-CO)/F5)
620 FORX=LTORSTEPF5
630 AD=S4*RO+X+B
640 POKEAD,F4
650 NEXT
690 REM  ADD 5-UNIT TICS ON Y-AXIS.
700 T=RO-FV*INT(RO/FV)
710 RO=RO+FV*INT((SX-RO)/FV)
720 FORY=TTOROSTEPFV
730 AD=CO+S4*Y+B
740 POKEAD,T4
750 NEXT
780 AD=CO+S4*RO+B:POKEAD,28
799 REM  CLEAR ORIGIN.
990 REM  START SCAN ON X
1000 FORGC=1TO64
1050 C=TW*(GC-WN)
1100 FORIC=WNTOTW
1150 C=C+WN
1200 X=(C-AC)*W6
1240 REM
1250 Y=X:REM  EXPRESSION FOR Y GOES HERE
1260 REM
1350 R=AR-SGN(Y)*INT(APS(YC*Y)+P5)
1400 IFR>F8THEN1850
1401 IFR<WNTHEN1850
1450 GR=INT((R+TW)*W3)
1500 IR=R-TH*INT((R-WN)*W3)
1550 IM=M(IR,IC)
1600 AD=B+S4*GR+GC
1650 P=PEEK(AD)ORIM
1800 POKEAD,P
1850 NEXT
1900 NEXT
```

line 10 — SA is the starting address in decimal of the polymorphics board. This should be changed to suit your installation.

line 15 — RO is the row of the origin. The display rows are numbered from top to bottom, 1 to 16. Selecting one of these for RO will locate the X-axis on that row.

line 16 — CO is the column of the origin. The display columns are numbered left to right, 1 to 64. Selecting one of these for CO will determine the position of the Y-axis.

lines 120-127 — Constants are set as variables to save conversion time.

line 126 — YC is the Y conversion constant, three units of display per unit of Y or about 16 units of Y from top to bottom.

line 140 — Array M contains the graphics values to be used in plotting the function at line 1550.

line 200 — This line clears the screen to all white. Plotting is black on white.

lines 490-530 — This routine draws the X-axis. The POKE at line 520 marks the top third of the origin row as the X-axis.

lines 535-570 — This routine draws the Y-axis. The POKE at line 560 marks the left half of the origin column as the Y-axis.

lines 595-750 — This routine clears spots on the axes at five-unit intervals.

line 780 — This line cleans up the origin.

lines 1000-1900 — This is the routine that calculates, converts, and draws the function.

line 1000 — GC is the display column from 1 to 64. This is divided into left and right half at line 1100.

line 1200 — Here the value of X is calculated as a function of the graphics column number. C is the graphics column, 1 to 128. AC is the conversion for the Y-axis location, and W6 is the scaling factor for X, about 6 graphics columns per unit of X or 21 units of X, left to right. Changing W6 in proportion with YC (line 126) will

The program listing is shown with a minimum of REMs to make it easier to copy. Comments are provided below, relating to line numbers on the listing. This program will run in an 8-K machine using MITS 8-K BASIC.

change the scaling of the graph.

line 1250 — This is the location for the expression of Y as a function of X. Any legitimate BASIC expression may be used.

line 1350 — This converts the calculated Y value to a graphic row number, 1 to 48.

lines 1400-1401 — These test the row value to see if it is off-screen.

line 1450 — This converts the graphics row (1 to 48) into a display row (1 to 16).

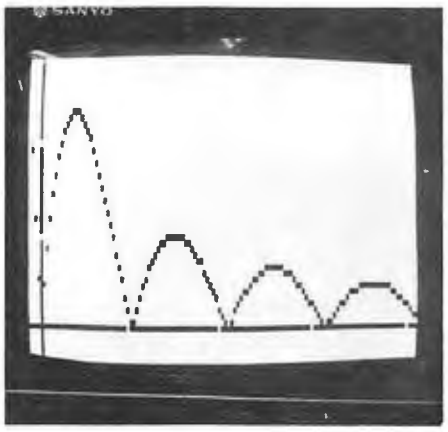
line 1500 — IR is the internal row number (1 to 3) within the display row.

line 1550 — Here the proper graphics value is selected from the M array depending on the position of the plotted point within the display row and column matrix.

line 1600 — AD is the address for the POKE in line 1800.

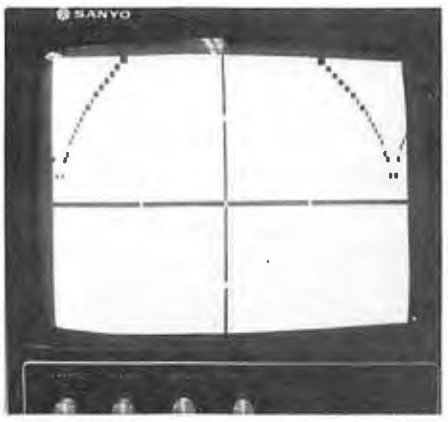
line 1650 — The selected graphics value is ORed with the present value of the display element to maintain the display at places where the graph crosses the axes.

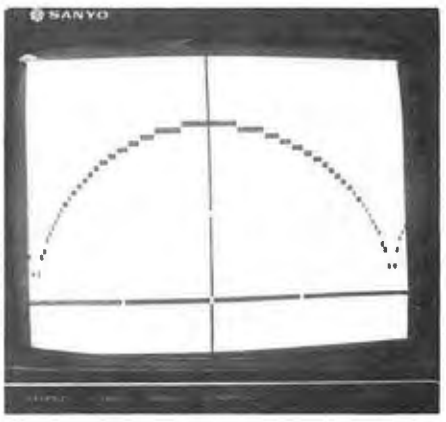
Two students using the graphing system.



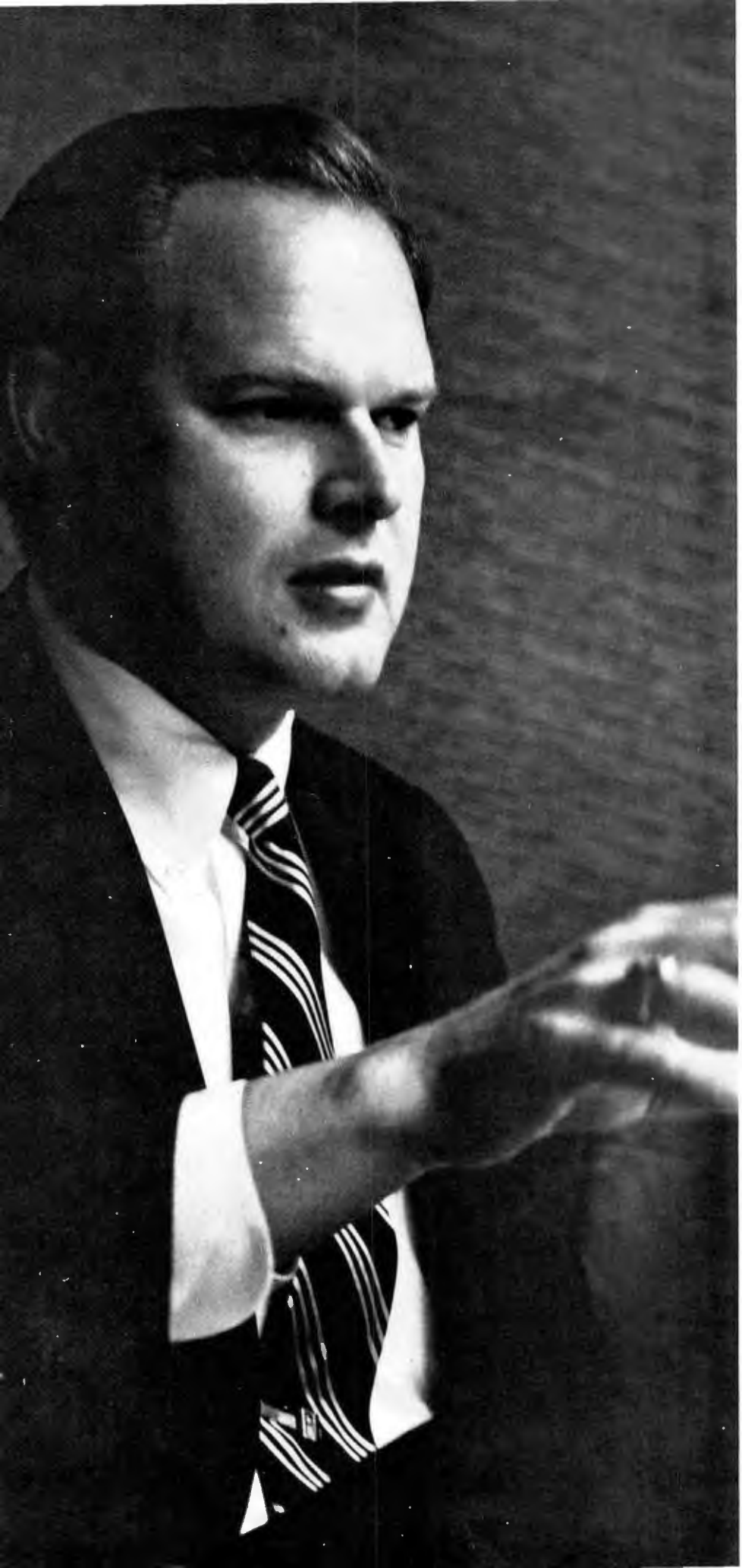
Graph of a bouncing ball function.

A graph of y = x with uniform random noise added.





The origin may be placed at any point on the screen. Here a graph is moved down in order to fit.



Here Comes PCC

On December 3, 1976, Pertec Computer Corporation (PCC) signed a letter of intent to acquire MITS. Last March PCC bought CMC, a manufacturer and distributor of data entry systems with a major end user marketing and service organization. In August, they bought iCOM, manufacturers of the "frugal floppy".

PCC is quite large by the standards of our industry and is obviously moving into the microcomputer field in a big way, so we felt that an interview with their president, Ryal Poppa, would be of interest.

We've left the door open for further dialogue between SCCS and PCC so please let us have feedback for them. We'd also like to hear from readers about what you think of interviews such as this and the ones we ran last month; and we'd like suggestions as to whom we should interview.

Ryal Poppa started out as an IBM salesman, and since has been a president and director of several major companies in the computing field. He is also a director of several trade organizations, is on the President's Advisory Council at Claremont Men's College, is a frequent guest speaker on topics within the computer industry and is the coach of a girls softball team.

Ryal Poppa
President of
Pertec Computer
Corporation

The Acquisition

Q. I Presume that the acquisition of iCOM and MITS are not passive investments, but part of an overall strategy in the microcomputer field. What are your major goals and plans?

We see future data processing really getting into the smaller machines; both small shared processors like our CMC XL40 or super small systems such as MITS makes. Our major thrust is towards small business systems, but not with a lot of applications software. We will provide good business languages – business BASIC, subsets of COBOL. We will also stress a high degree of vertical integration, with R and D manufacturing, marketing, distribution, finance, maintenance, etc. under one roof.

Q. What other companies or sorts of company might you acquire?

We are an acquisition-minded company, as evidenced by our past performance. We are constantly evaluating potential acquisitions, focusing on companies within our industry; and over the next five years, we can anticipate future growth through that route. The main emphasis of any future acquisition is the expansion of the company's overall capability to serve the computer industry. In other words, an acquisition would have to complement our existing line of products, not simply expand them. We don't want to buy another version of a tape transport or disk since we have the capability to develop them ourselves.

We've been looking for a line printer company for a year. We're very active in trying to find the right one.

Q. Will PCC be active in the management of MITS? Will there be changes in management personnel?

We have no plans for changes in management personnel. MITS will operate relatively autonomously, as is our typical operation with our divisions. What MITS is doing today is working very well and you don't like to mess around with a thing that's running well and making money.

The way we typically operate is to provide financial controls and money and to try to tie together the various components of the organizations. For example, our peripherals are sold by other divisions and those divisions give us input as to what new peripherals to offer.

We can also help in the manufacturing process because we are one of the better small manufacturers in the United States in terms of electronics. They don't need any help in the area of marketing; as a matter of fact, we can learn from them.

Q. How will MITS fit into the PCC organization structure?

Assuming that the proposed acquisition is completed successfully, MITS will become a division within our Microsystems and Peripherals Group. This Group is currently composed of the Pertec Division and the iCOM Division. The Pertec Division designs, manufactures, and markets digital magnetic tape transports and disk drives; the iCOM Division designs, manufactures, and markets floppy disk drives and controllers, microprocessor-based subsystems, and micro-peripherals.

Q. How large is MITS relative to PCC? Will it become a larger portion?

PCC sells roughly one hundred million per year and MITS six million; however, MITS is currently shipping at a rate of eight million per year and will probably hit ten to twelve million next year.

Q. Will any of MITS operations move to Los Angeles?

No. However, some of our production people will go down there.

Q. Was MITS in need of capital? Will you put capital into MITS?

When you are growing at a rate of 100% per year, you can't do it without a lot of capital injection and they didn't have that kind of capital availability.

Q. What were the terms of the sale?

I'll pass on that one.

Markets

Q. What do you see as the relative growth potentials of the following market areas: Hobbyist, home computing (non-hobbyist), small business and school.

As I stated earlier, our major thrust will be toward the small business systems market. The major market of the future is packaged, ready to go systems. The kit business will pass from the scene, except as a very small segment of it. Probably 70% of the volume will be prepackaged systems in the next four or five years.

You can't afford to buy, build and test a kit. It is cheaper to sell assembled systems. Personal computing applications in the home for non-hobbyists and non-professionals will not be important for a number of years; not until the cost comes down substantially more.

There is a big market in education. I think we'll see a MITS computer or two in every elementary school within the next five years.

A small school can have one in the business office, one in the math lab and one in the science lab. My twelve year old daughter thoroughly enjoys it.

Q. If the kit market is relatively unimportant, will you abandon the hobbyist?

No market is "unimportant", but it is not a major market. Although not our major market, the kit market will continue to exist and we will always serve it.

Q. What other major opportunities exist?

A large company with many branches and service offices will buy a machine for each office. Auto dealers or local insurance company offices are examples of this sort of operation.

For instance, an independent State Farm agent might put together a system he bought from a store. If State Farm management saw it, they would contract for it through us and the local store owner would get a major piece of the business.

The stores and end users will develop products and we will do a lot of "sheparding" to make sure that it can be replicated. If a person in a store feels he has a replicable product under development, he could make a proposal to us and we might subsidize his effort.

Q. Where will PCC concentrate?

PCC's niche will be based on a very good manufacturing and marketing capability that applies to the markets we are after. We will differentiate ourselves into certain special industries, where we will become very strong. I'll have to pass on which those industries are, but we have selected the ones on which we'll concentrate.

Distribution Channels

Q. Will the CMC sales and service force represent MITS and iCOM products?

The CMC sales force might carry MITS and iCOM products in geographic areas where they would not compete with stores. CMC service will also be available and any store may contract for service through CMC if they wish. If a store wants to do their own service, they may.

One of the keys to the CMC acquisition was their service network. Service is vital. The toughest thing to build is a good service network. Service is one of the keys we can give to MITS.

Stores will handle modular machines and do custom installations, but if you want to buy 100 somewhat specialized items, then the store will have first rights, but we would build it for them.

Stores will serve the dense urban markets but there are many businesses operating outside of those areas and that's where PCC would be selling directly.

"One man in a garage" OEM shops – people who can sell, integrate and program small business systems are another important distribution channel.

Q. What are your plans for the existing MITS computer stores?

As the market moves from hobbyists to consumers, from kits to turnkey systems, the retail computer store will play an important role. These stores will serve as the major outlet for small business systems.

We have 26 stores now and plan to have 70 in a year. MITS has been very careful and conservative in screening store owners for business and technical competence as well as financial stability.

We are going to promote and enlarge the computer stores and make it easier for them to do business. We aren't planning massive changes, but plan to expand the distribution network and give them product. Shipments will be much improved. The delivery backlog, which has been as long as 90 days in the past, will be shortened.

In large measure, the customer will come to the store to buy the product rather than the salesman going to the customer.

Q. Will you continue MITS' policy that their stores carry only MITS computers?

To the extent possible, we will continue to require that the stores handle MITS products exclusively. However, in a small town it may be wise to have a joint operation.

Q. Will you control the stores more than in the past?

MITS works very closely with their stores now – they have procedure manuals, accounting help, display help, etc.; however, they are and will continue to be independent businesses.

Q. Can computer stores effectively install and support business and industrial systems? Can they provide the lower 90% of the IBM "iceberg"?

The computer store will have the same and perhaps better capabilities. They will be able to give systems analysis, programming, hardware integration, installation and maintenance services. Only a few have this capability now, but they will all develop it.

Product Plans

Q. MITS and iCOM were pioneers, but their products seem to be losing their competitive edge, in the hobby field at least. How do you plan to keep them leaders in the field? Have you any specific new product plans?

There is a lot of price cutting going on and we may not be cheapest, but as far as performance, I feel that our product line is the best in its segment of the market today.

MITS and iCOM were both pioneers in their markets. According to traditional industry research organizations, there are currently an estimated 10,000-15,000 hobby computers in use and the number will grow 10,000 to 15,000 per year for the next three years. To date, MITS has sold over 10,000 systems, of which probably 80% are in the home or hobby market. I think it is safe to say that MITS is the leader in its industry. iCOM is generally recognized as the leader in the overall microperipheral subsystem industry.

We have new product plans in both the MITS and iCOM lines. We

will necessarily have lower cost peripherals, but not faster – I don't feel we need faster peripherals. I can't tell you about specific products today.

Q. What are your plans for a microcomputer based business data processing system? What prices do you forsee for a disk based system? Is there a place for tape based systems?

Today we can sell business systems, without applications software, for $8-$15,000. In five years, the price for a very powerful business system will be in the $5-$7,000 range (CRT, keyboard, tape and disk).

We have an in-house developmental project on cassettes, but haven't yet committed it to manufacturing because it has been unclear that that's the market we want to penetrate. We will commit to a major developmental effort in a small serial access device as soon as the MITS acquisition is final.

Q. No one seems to be developing applications software, will you? How will it be distributed?

Applications software will be developed by the stores and other elements in the distribution network. That way we don't get tagged with the tremendous cost of developing the generalized application packages. Even a business BASIC or COBOL might be developed at a store.

The software will be distributed by all of our stores.

Q. What about the Altair "standard" bus – will it remain a standard? Should it?

We believe that the Altair bus is a broad enough standard that, though it may be improved, it is expandable to be used for anything we want to do in the future. There are many interfaces and devices that are built around that very fundamental structure called the "Altair bus". We should change only if we see some major new advantage for the customer. It's nice to have a standard.

Q. How long until you have a 16-bit system?

We have no real plans for a 16-bit machine. Much discussion but no plans.

The Industry

Q. What is the potential from Japan as a market and as a competitor? Do you see the fully packaged $200 computer forecast for 1977 by Vantage Research as a possibility?

I've just returned from Japan and can state categorically that the Japanese fully plan to become a major power in the computer industry. They are currently developing "super LSI". The initial marketing thrust for Japanese computer companies will be to countries other than the United States and European countries. Then the move will be toward Europe, followed by a move toward the U.S. market, although this may be years in the future. However, I do not believe the Japanese will become a dominant force in the U.S. computer industry as they've become in the U.S. television or radio or camera businesses.

We will compete effectively because of automated manufacturing facilities and vertical integration. Vertical integration, R & D, manufacturing, marketing, finance, etc. is the whole secret to the future of the small computer business.

In about one year, Japanese labor costs will have risen to the point where they are a ready market for a small business system. At that time, PCC will enter the market primarily through Japanese based distributors.

[Editors note: the suggestion of a $200 machine got a laugh]

Q. Will large semiconductor/consumer product companies such as TI, National, and Intel enter the hobby, home computer and small business markets?

Probably Intel will be first and I'm surprised they aren't in the market yet. Because the electronic content of a system is so small today, that gives them an edge, a little edge, but not much of an edge. The peripheral and marketing capability are much more important.

Q. Will mainframe manufacturers such as IBM, DEC and HP enter these markets?

They will enter very slowly, from the top down. They can't afford the overhead. You can't market these systems the way you do a (IBM) system 3 or even 32. It must be marketed primarily by the customer coming to the salesman, rather than the other way around. This reduces your cost substantially.

NCR might be able to do this, and do it very well. IBM would find it very difficult to do. DEC and the other mini companies will continue to work down on the OEM side, but not get into the end user market. They have too much on their plate now.

Q. How will the entry of large companies affect the industry, Will small manufacturers be absorbed, will it become an oligopoly?

All the small companies could be gone in five years. I think there will be a tremendous shakeout of the little guy and only large companies with full vertical integration, full marketing capabilities and strong finances will make it. Companies like PCC, Intel, and National will be able to sustain themselves. An analogy can be made to the pocket calculator industry. Five years ago, any number of companies tried to enter this industry; today, only a handful are left, mostly those that were fortunate enough to realize early in the game that vertical integration throughout the manufacturing process was a prerequisite for survival.

A Four Port Serial I/O Board

By John Borders

When John Borders added up the cost of all the kits necessary to interface everything he wanted to hang on his Altair, he decided to wire wrap a custom designed serial I/O board. This article includes complete construction information for a 4-S I/O which cost about $100, including an Altair prototyping board.

John's stategy represents a happy middle ground between the person who is totally dependent upon kits and assembled machines and the person who builds his entire system from the ground up. It feels like a good way to go, and we would like to hear from others who have built accessory boards. Let us know what you guys are doing with all of your $29.95 prototyping boards so we can share the information!

John has been incredibly active in SCCS—he is a charter member, is vice president of the Ventura County Chapter and is a member of the SCCS Board of Directors. In his spare time, he earns a living as an electrical engineer and designs boards such as this one for his Altair.

John Borders
may be reached:
c/o Ventura County
Computer Society
Box 525
Port Hueneme, CA 93401

A long time ago I bought a serial interface board for my Altair 8800 and it served my needs well for a while. Then the noise of my TTY started to drive me straight up the wall. It was also taking up to two hours to destroy all the Klingons and make the Galaxy safe for the Peoples of the Federation. Unsatisfactory. So I bought a CRT terminal. It is both quiet and very fast. (2133 cps instead of 10). While I will admit that I can't enter data quite that fast, the rapid output rates have cut the time required to make the Galaxy safe to under 15 minutes. But I could not use both the TTY and the CRT terminal at the same time because I only had one serial interface. It was a real pain to change the serial board from a 20 mill current loop configuration running at 110 baud to an RS-232 configuration running at 19,200 baud.

The solution was obviously another serial interface board, but I was almost out of slots to plug boards into. I could have bought a 2SIO board and sold my old serial board, but the price seemed a bit steep. I also decided that I wanted yet another serial interface for a telecommunications modem. Then a group in Kansas City came up with a standard cassette recording technique for hobby computing people (thats me and probably you) to interchange digital cassettes with. I liked it and was suddenly faced with the need for yet another serial interface. However this one was a little harder because nobody was beating a path to the market place with a standard cassette interface that would plug into my computer.

Then inspiration struck—I would build one wire wrap board that would do all of these things, would run MITS's Basic with no software changes, and would cost under $100. Not a bad deal, especially compared to a 2SIO board ($190), a 1SIO board ($150), and a cassette interface board ($90).

After a little thought, the schematic shown in figure #1 was arrived at and combined with an excellent cassette interface. The parts were selected because they are readily available at reasonable prices from reputable mail order firms. The complete 4SIO consists of four logical parts: 1) the board select logic, 2) the UARTs, 3) the clock generator, and 4) the cassette interface. The whole thing fits on one standard wire wrap board with space left over for 11 additional ICs (photo #1), and consumes about 450 ma from the +8 volt supply, 20 ma from the +16 volt supply, and 70 ma from the −16 volt supply.

The board select logic consists of a 74L85 four bit comparator (which has been made into a 5 bit comparator using the expansion inputs), some gating, and two 74L42 one out of ten decoders. If the upper five address lines compare to the hard wired unit number (00000YYX binary shown) and an output operation is being performed, then one of IC 112's first eight outputs will go low. This will cause the status

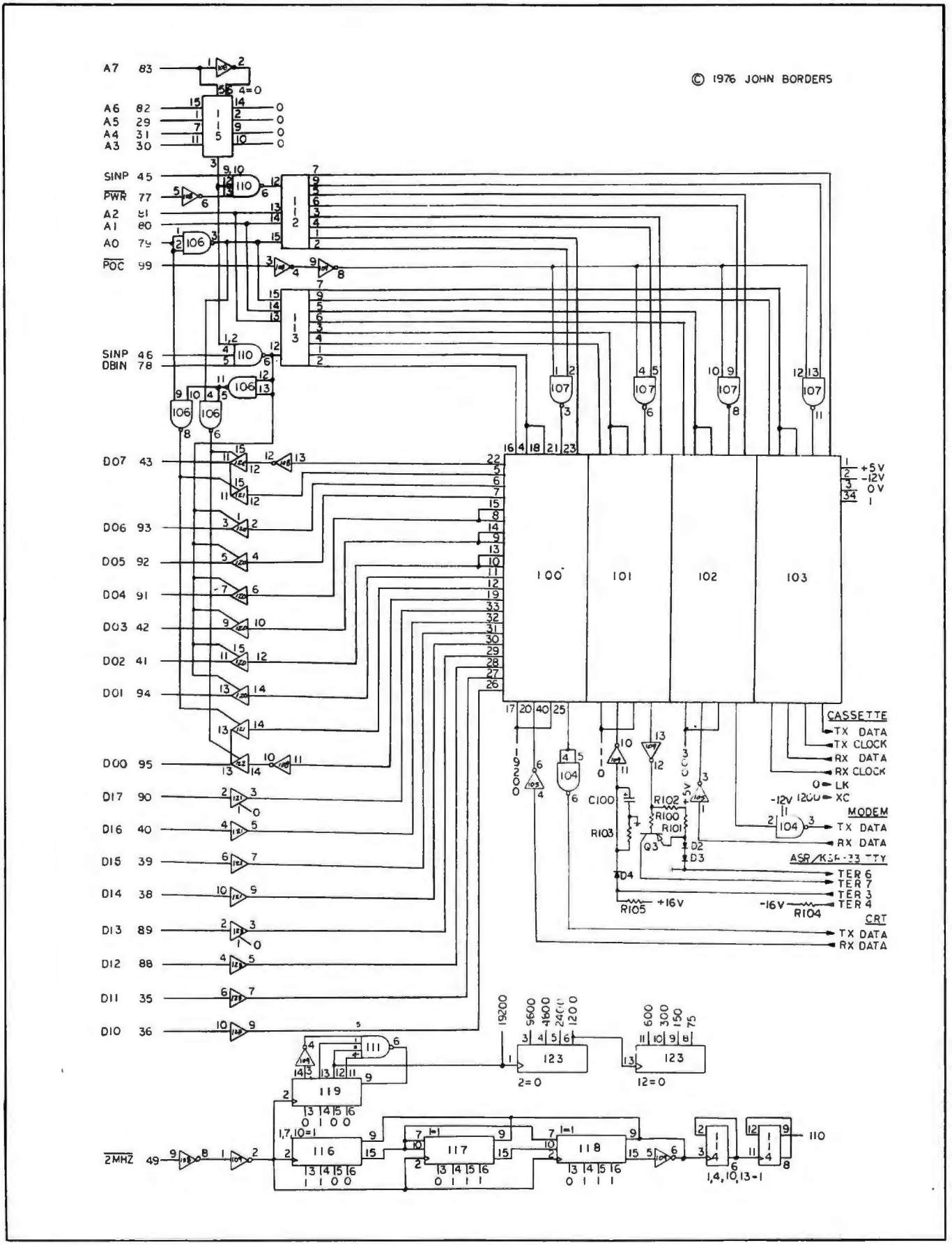

© 1976 JOHN BORDERS
A7 83
A6 82
A5 29
A4 31
A3 30
SINP 45
PWR 77
A2 81
A1 80
A0 79
POC 99
SINP 46
DBIN 78
DO7 43
DO6 93
DO5 92
DO4 91
DO3 42
DO2 41
DO1 94
DO0 95
DI7 90
DI6 40
DI5 39
DI4 38
DI3 89
DI2 88
DI1 35
DI0 36
2MHZ 49
100
101
102
103
+5V
-12V
0V
CASSETTE
TX DATA
TX CLOCK
RX DATA
RX CLOCK
LK
XC
MODEM
TX DATA
RX DATA
ASR/KSR-33 TTY
TER 6
TER 7
TER 3
TER 4
CRT
TX DATA
RX DATA
C100
R102
R100
R101
R103
Q3
D2
D3
D4
R105
+16V
-16V
R104
19200
9600
4800
2400
1200
600
300
150
75
123
2=0
12=0
111
119
116
117
118
110

Figure #1

flags of UART YY to be reset if X is low. If X is high, then this will cause UART YY to input data from the computer's input data buss, to transmit the data serially, and to change the transmit status flags as required. If the upper five address lines compare to the unit number and an input operation is being performed, then one of IC 113's first eight outputs will go low. This will cause the status flags of UART YY to be placed on the computer's output data buss if X is low. Figure #2 explains the status flags that are placed on the buss. If X is high, the UART's receive data buffer is placed on the computer's output data buss, and the UART's data available status flag to be reset.

Input Control Word

Bit	Name	Explanation
0	$\overline{DA}$	Data is available to input if bit 0 is low.
1	—	Not used.
2	RPE	If the received character parity does not agree with NPB and POE, then bit 2 will go high until the UART is reset.
3	RFE	If the received character stop bit(s) do not agree with NSB, then bit 3 will go high until the UART is reset.
4	ROP	If the received character is not input by the computer before a subsequent character is received, then bit 4 will go high until the UART is reset.
5	—	Not used.
6	—	Not used.
7	$\overline{TBMT}$	The output buffer is empty and available to output data if bit 7 is low.

Figure #2

The UARTs are completely buffered from the data busses for two reasons: 1) they don't have enough power to drive the buss, and 2) their inputs would place an excessive load on the buss. Each UART has five inputs that determine the data word length, the number of stop bits, and parity operations. Figure #3 explains each of these inputs, and figure #4 shows how they are connected for common I/O devices. If you have a Baudot TTY, such as a Model 14, then you should use a 2017 UART for IC 101 and you may

UART Control Pin Functions

Pin	Symbol	Name/Description
36	NSB	Number of Stop Bits This input selects the number of stop bits. A low input selects 1 stop bit; a high input selects 2 stop bits. Selection of two bits when selecting a 5 data bit word generates 1.5 stop bits from a 2017.
37	NDB2	Number of Data Bits
38	NDB1	Per Character These inputs are decoded to determine the number of data bits per the following table:

NDB1	NDB2	Data Bits/ Character
L	L	5
L	H	6
H	L	7
H	H	8

35	NPB	No Parity Bit
39	POE	Parity Odd/Even These inputs are decoded to determine the parity mode for both the receiver and the transmitter per the following table:

NPB	POE	Mode
L	L	Odd Parity
L	H	Even Parity
H	H or L	No Parity

Figure #3

UART Control Pin Connections For Common I/O Devices

Device	NPB	NSB	NDB2	NDB1	POE	UART
ASR-33 TTY	H	H	H	H	H	2502
KSR-33 TTY	L	H	H	L	H	2502
Model 14 TTY	H	H	L	L	H	2017
Cassette	H	H	H	H	H	2502
Modem	L	H	H	H	H	2502

Figure #4

have to change the TTY interface circuit shown. The 2017 UART has the same pin connections as the 2502 UART, but it is capable of selecting 1.5 stop bits if 5 data bits are selected. It is also harder to find and a tad more expensive than the 2502.

The clock generator has two sections. The first section (IC 119) divides the computer's crystal controlled 2 mHz signal by 6.5 to obtain a 19,200 baud 16X clock. As most of you know, dividing by 6.5 is difficult. What is actually done is to divide by 13. The next to last flip-flop in the divider has a divide by 6.5 pulse rate and all of these pulses meet a standard UART's minimum pulse width requirements. No need to spend extra for a high speed UART if you want to run at 19,200 baud. This 19,200 baud clock is further divided to provide 9,600, 4,800, 2,400, 1,200, 600, 300, 150, and 75 baud clocks. The second section (ICs 116, 117, 118) provide any weird clock rate that might be needed. The presets shown are for 110 baud. IC 114 ensures that the UART's minium clock pulse width requirements are met.

The cassette interface that I used was the "Bit Boffer" designed by Don Lancaster of Synergetics and published in the March 1976 issue of BYTE magazine. Since I found all (?) of the errors in the article and got the interface working, I have been extremely impressed with its high quality, immunity to errors, and insensitivity to speed variations. The cassette interface parts are included in the parts list, figure #5. Figure #6 lists the errors that I found in the "Bit Boffer" article, and

4SIO Parts List

Quanity	Description/Part Number
1	Wire Wrap Board (Vector #8800V or equivalent)
4	40 pin wire wrap sockets
11	16 pin wire wrap sockets
16	14 pin wire wrap sockets
31	wire wrap pins (note: one cheap & easy way to get these is to take apart two 16 pin wire wrap sockets)
1	LM340-5.0 voltage regulator
1	LM320-12.0 negative voltage regulator
3	2502 or AY-5-1013A UARTS (ICs 100, 102, and 103)
1	2502/AY-5-1013A *or* 2017 UART (see story) (101)
1	1488 (104)
1	1489 (105)
2	74L00 (106, 107)
1	74L04 (108)
1	7404 (109)
2	74L20 (110, 111)
2	74L42 (112, 113)
1	74L74 (114)
1	74L85 (115)
3	74LS163 (116, 117, 118)
1	74163 (119)
3	74367/8097/8T97 (120, 121, 122)
1	74393 (123)
1	CA3130 (IC 6)
1	4001 (3)
3	4013 (2, 5, "7")
1	4018 (1)
1	4070 or 74C86 (4)
2	MPS6523 or 2N2907 (Q1, 3)
1	MPS6521 or 2N2222 (2)
1	XC526R or equivalent LED (D "1")
3	1N4148 (D2, 3, 4)
2	200 Ω (R100, 101)
2	330 Ω ("20", 103)
1	470 Ω (105)
1	1.2 kΩ (104)
4	2.2 kΩ (9, 10, 18, 102)
1	3.3 kΩ (11)
1	4.7 kΩ (6)
3	10 kΩ (14, 15, 19)
2	22 kΩ (3, 5)
3	33 kΩ (4, 7, 8)
4	47 kΩ (1, 2, 12, 13)
1	100 kΩ 10 turn pot part number 43P104 (17)
2	100 pf (C2, 3)
1	200 pf (11)
2	470 pf (10, 13)
2	.001 μf (5, 15)
1	.0015 μf (6)
1	.0062 μf (4)
1	.01 μf polystyrne (12)
1	.047 μf (8)
8	.1 μf (1, 7, 105, 106, 107, 109, 110)
1	2.2 μf 6v tantalum (100)
4	15 μf 25v tantalum (101, 102, 103, 104)
1	47 μf 6v tantalum (9)

note: all resistors are .25 watt ± 5% carbon comp unless otherwise stated
all capacitors are 15 volt ceramic unless otherwise stated

Figure #5

Errata to "Bit Boffer" article

Page 35 Figure #5	1) IC 3 is a 4001 not a 4011
Page 35 Figure #6	2) IC 6 pin 6 is labeled pin 5
	3) IC 4c and 4d are shown connected as an oscillator. The easiest way to fix this is to disconnect IC 4d pin 12 from 4c IC 4c pin 10 and connect 4d pin 12 to IC 6 pin 6.
Page 37 Figure #9	4) The two inputs to the tuning indicator schematic are reversed, that is test point "e" should be connected to pin 3 of the 4013 (IC "7") and the receiver data output (RD) should be connected to pins 4 and 11 of the 4013 (IC "7").
	5) The ground and +5 connection for the tuning circuit board are interchanged.

Figure #6

as I have not seen mention of them in BYTE, it is included to save you the joys of discovery. When I constructed my cassette interface, I permanently installed the tuning circuit mentioned in the article, and it has proved very handy in finding blocks of data on cassettes. The lockout circuit shown in article (IC. 5b, R16, C14) is not required for 2502/2017 type UARTs and should be deleted.

Observe extreme caution when connecting I/O devices as they can possess dangerous voltages. Terminals 1 and 2 on the TTY terminal block have 120 vac on them, and I know one poor sole who mistakenly connected his Altair to them instead of terminals 3 and 4. Learn from his mistake and don't discover the joys of buying a complete new set of ICs. Also, be careful when installing the LM320-12 negative voltage regulator, as its pinouts are different than the LM340-5 voltage regulator.

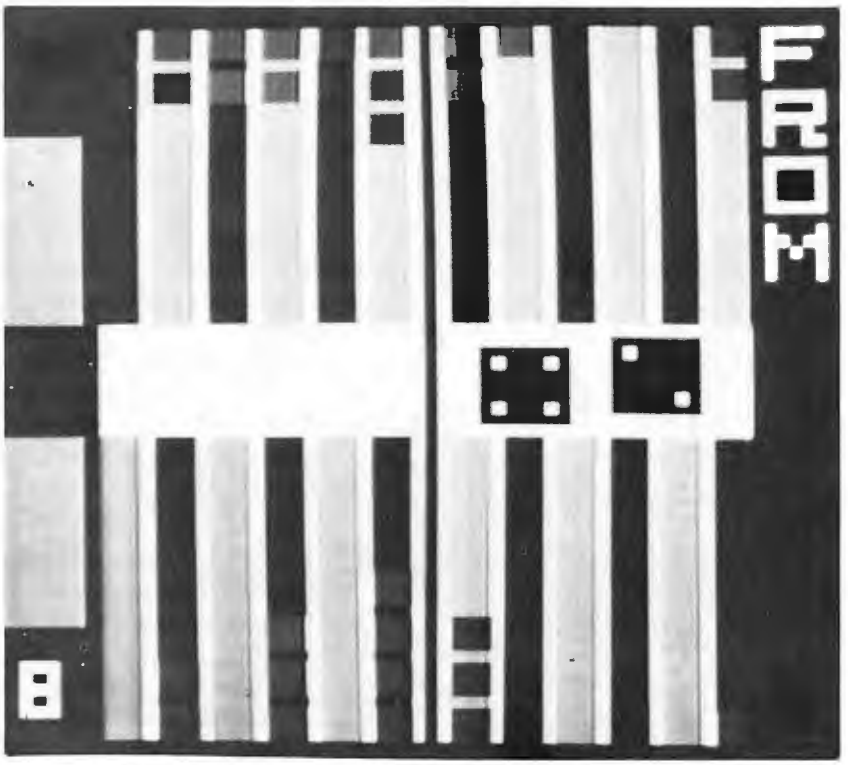
Happy wire wrapping.

Jack Gammon

By Karen Wolff and Phil Feldman

A glance at the accompanying photographs shows that Danny Kleinman and Steve Grumette have achieved an impressive system for playing backgammon. In this article, we present a description of their Altair-based machine as well as the story of its development. Even if you aren't into backgammon, you'll learn something of the arduous process of developing a prototype for a complex product if you read on.

Karen Wolff and Phil Feldman are members of the illustrious* Interface *editorial staff!



Photos by Tom Rugg

The Backgammon board displayed on a TV-Dazzler.

The Backgammon machine with Steve Grumette (standing) and Danny Kleinman (seated)

Microcomputers – Backgammon – Video Games, certainly three of today's hottest phenomena. They have all come together in a project called Jack Gammon developed by Danny Kleinman, Steve Grumette, and Mike Gilbert. It is a backgammon playing color "television set" driven by microcomputer. The inventors call themselves the "Gammoneers". Somehow the program got the nickname Jack and so they call their project Jack Gammon.

Backgammon, for those who might not know, is a game played with dice, a board with twenty-four long triangular points, and two sets of fifteen men. It's the game on the other side of the checkerboard. Its history dates back to ancient Sumer, making it, possibly, the oldest game in existence. It has been played in one form or another in ancient Egypt, Greece, Rome, Persia, India, China, Japan, Mexico, and North America. Soon, you'll be playing it with a computer.

The rules of the game can be found in most standard game or "Hoyle" books.

The Gammoneers

The project began when Danny was approached to build and market a computerized backgammon-playing machine around mid 1975. He then reached Steve who had recently purchased an Altair 8800. Soon Mike Gilbert, an expert backgammon player, joined them. So they started as three: Mike Gilbert the backgammon authority; Steve Grumette, the hardware engineer; and Danny Kleinman, the designer and programmer. However, Mike left the group almost a year ago and Danny is now assuming the strategy responsibilities also.

Steve Grumette is a film maker. With his wife Elizabeth, he has worked as producer, director, film editor and writer on over thirty films. They have received wide recognition and acclaim for their excellent films on artists such as Jesse Allen, Gregor Piatigorsky and Robert Gilbert. Their film on Robert Gilbert won an Academy Award for best live action short subject in 1969 and an award at the Cannes Film Festival in 1970.

Danny Kleinman has worked as a programmer since 1960 and now works independently as a programming consultant. He has been an expert chess and bridge player for many years, but has only been interested in backgammon the last few years. He described, with excitement, how he learned the mechanics of the game and later watched Mike Gilbert until, almost suddenly, eight months ago, he began to see the game as a whole. He has become quite an expert and has been asked to teach backgammon.

Playing against Jack is quite an impressive experience. The video display projects a backgammon board in vivid color. The "points" are rectangles instead of triangles; the "men" square instead of round. A control panel with several buttons interfaces the human player with the computer. Jack can play at ten different levels of skill so the first task is to select the quality of opposition you prefer. Jack "rolls the dice" for both sides, displaying two large die faces for each roll. A doubling cube is also used. If you think your position warrants a double, you simply press the "DOUBLE" button. Jack will respond on the video message panel with a "PASS", "TAKE" or "BEAVER". Similarly, if Jack doubles you, you must press the "PASS", "TAKE", or "BEAVER" button. The control board contains a copy of the backgammon board with buttons adjacent to each point. After your dice appear, the message panel says "FROM". You now press the button next to the point you wish to move from. The message "TO" is now displayed and you then press the button next to the point you want to move to. When a full move is legally completed, the message panel says "DONE". If you're satisfied with your move you press the button "DONE" and then Jack takes his turn. But if you wish to reconsider your move, you can press the button "RESET" and restore the position to what it was before your trial move. Many diagnostic messages are displayed if you should try anything illegal. If you want to know how you stand in the race, you can press the button "PIPS" and get the current pip count of each player. Suppose you feel you've been getting "unlucky" dice. Well, you can even press "DICE" and get "new dice" simulated by changing the color of the dice on the display. After each game a running score of the match is kept. Jack is easy to get used to and after a few tries the mechanics of play are easily mastered. He can also be used as simply a backgammon board and dice roller with two human players pitted against each other.

Jack is Born

This sophisticated prototype had a modest beginning. Steve's initial purchases were an Altair 8800 with 1K, a serial board, an ACR interface board and a cassette recorder. He soon had a Comter terminal. These were all bought pre-assembled. Steve then bought and assembled two 4K RAM boards.

The programming for Jack was begun in Basic. They used MITS 8K Basic which resided in approximately 6K. Of course, the available memory was quickly used up and they bought another 8K to expand their code. This also enabled them to use MITS Extended Basic. Next, an ASR 33 Teletype was added for a better I/O facility during program development. The playing was done by Danny sitting with a backgammon board and typing numbers on the teletype which corresponded to various actions and moves. Jack would respond with his moves through the teletype and Danny would update the board by hand. Specific positions and dice rolls could be set up to

test Jack's response.

When the 17K configuration proved too small, another 8K was added. Actually they bought four 4K Processor Technology static RAM boards and removed the original two 4K dynamic boards. Thus the system was expanded to 25K, all of which was static memory. This was at about the end of 1975. By then, a Tarbell Cassette Interface was used to store and load the programs. Steve feels it is "by far" the best method of saving and storing programs on tape.

Jack Gets Dazzled

The next big step was the introduction of the video display. A Panasonic television set was interfaced through a Cromemco Dazzler. "The Dazzler provided us with quite an opportunity and quite a headache at the same time," Steve recalls. The problem was that Cromemco's documentation, although excellent on the hardware, provided little idea of how to write good software. No real examples were given. Also, the encoding to interface display images with the Dazzler seemed somewhat awkward to me." Steve solved this by writing a routine he calls the "nibble writer." The programmer simply inputs a vertical and horizontal position with a color code. The "nibble writer" then updates the appropriate memory locations reserved for the Dazzler to effect the desired results on the video display.

Even with this new routine, the process of writing the video display routines was slow and laborious. Each man was painted out – checker by checker. The letters of each message on the display were painted out one white dot at a time. What was worse, the execution times of these routines, and most of Jack's routines for that matter, were painfully slow with Basic.

Fortunately, the user-subroutine feature of MITS Basic proved a great help. By using the USR, PEEK, and POKE statements, machine language routines could be interfaced with their Basic program. Danny wrote one to speed up the message panel and get it to flash which improved execution speed by a factor of 100 plus. It became clear that the whole program would have to be converted to machine and/or assembly language.

Jack Goes to Albuquerque

Right about this time, in early 1976, a milestone was upcoming in Jack's career. MITS was having a convention in March and a demonstration contest for Altair based projects would be held. Many prizes were in the offing. The Gammoneers decided to present Jack.

A wooden housing was built for Jack. Several buttons were installed on it for the user to communicate with the machine. These controls were wired as a simple extension of their Comter keyboard, using a parallel I/O board. Thus the user was faced with a full-fledged prototype of a video backgammon game. He simply pressed buttons to roll the dice, make his moves, select Jack's skill level etc.

Unfortunately, by the time of the convention most of the program was still "Basic bound" and Jack would sometimes take several minutes to select and execute a move. This was of course a nuisance and perhaps cost Jack first place in the contest. Third prize was awarded to the project and the Gammoneers received a 16K static memory board for their efforts. After the convention, this was added to their memory. The 1K board was removed bringing the whole system up to 40K.

Jack Grows Up

The big hang-up was still the slowness of Basic. At one point the program occupied 32K of memory, surely making it one of the longest MITS Basic programs in existence. As investor interest was kindling, the next step was to convert the code to assembly language.

A-VID ELECTRONICS CO. has in stock:

SWTPCO at New Low Prices

- MP 6800 Microcomputer Kit now with 4K of memory
  Still only **$395.00**
- 4K Memory Expansion Kit (MPM + MPMX)
  Now only **$100.00**
- Coming in March: New 8K Memory Kit
  Order now **$250.00**

From Smoke Signal Broadcasting:

- 16K Static low power Ram Board assembled and tested
  Available now **$595.00**
- Prom Board available Feb. 1st. Uses 2708's – Room for PIA's; comes with connector for Frugal Floppy **$179.00**

Other Items:

- Oliver Paper Tape Reader
  Kit **$74.50**
  Assembled and tested **$95.00**
- Lear Siegler ADM-3 24 line by 80 kit **$875.00**
- Prototype Boards - 3 kinds
  All under **$25.00** ea.

Software:

- SWTPCO Editor, 4K and 8K Basic from **$4.95**
  Floating Point, Scientific Functions, TSC Games Vol. 3 All for **$53.00**

Books:

- New Basic Programs for business, math & etc. 3 volumes **$25** to **$40**
  Sippl's Dictionary **$9.43**
  Osborne's Microcomputers Vol. I & II **$7.50** & **$12.50**

A-VID electronics co. **1655 E. 28th St., Long Beach, Ca. 90806**

(213) 426-5526 -
Ask for Reynold Johnson
NEW HOURS:
Mon. - Wed. 8:00 a.m. to 5:00 p.m.
Thurs. & Fri. 8:00 a.m. to 9:00 p.m.
Saturday 9:00 a.m. to 5:00 p.m.
BankAmericard & Master Charge Accepted

Circle No. 10 on Inquiry Card

NOW TRY US!

The word is getting around ... the Byte Shop of Pasadena is a remarkable exception to the rule among computer stores. We offer a truly delightful environment supported by

* REAL courtesy
* REAL expertise
* EXPERT service
* GREAT classes
* EIGHT demo systems

and of course, a wide variety of low-priced computer hardware, software, tools and supplies. Come see what the happy rumors are all about ... then compare our store with ANY other!

THE AFFORDABLE BYTE SHOP COMPUTER STORE

The BYTE SHOP of Pasadena
496 South Lake Avenue
Pasadena, California 91101
Telephone: (213) 684-3311

- HOURS -
Tuesday - Saturday: 12 - 9
Sunday: 12 - 5
Monday: closed

Mastercharge Bankamericard
American Express

Circle No. 11 on Inquiry Card

So from May through July all the routines were converted with the help of the user-subroutine feature The assembler used was a Processor Technology Software Package I which Steve customized for their particular needs.

Not only did this conversion greatly reduce Jack's response time but it effected a great savings in memory space required. The complete program now resides in less than 12K. There are approximately thirty assembly language routines, and throughput increased by a factor of 400 or so from the Basic version. In fact, Jack's response became so fast that some timing loops had to be added to slow him down. He now plays at about the speed of a fast human player.

Danny is still working on improving Jack's strategy. "I'm not quite happy with some of his play at the highest skill levels," he says. "The process of debugging and improving Jack's play is tricky. When Jack makes a poor move it is usually for one of three reasons: I have a programming error; the heuristics in Jack are inadequate; or Jack needs another strategic concept to govern that situation. Discerning which one is controlling the situation is not always easy. However, I find that inspirations occur continually and Jack *is* getting better and better."

For a discussion of the software details required to program backgammon, see the companion article in next month's *Interface*.

To give Jack a good field test, Danny took the machine to the Cavendish Club in Hollywood where it could compete against many good players. "Jack did pretty well," he recalls. "In fact he played one game with Billy Eisenberg, the current world champion, and won!" We wondered if that gave Jack some claim to being the best player in the world. "Of course the results of one game don't mean anything," replied Danny. "Too much luck is involved unless you have a match of several games. But Billy was sure shaking his head."

The Future

When the software is finally fine tuned, (within two months hopefully) they plan to market their machine. "Our final configuration should execute in about 13 1/2K of memory," according to Steve. "11K of ROM will be used for the program. About 1/2K of RAM will be needed for work space and 2K will be needed for the Dazzler display. Probably we will build six prototypes at first. We may use the Poly 88 from Polymorphic Systems. This will be more economical than our present configuration. Who knows, we may even design a one board computer with one parallel input port and a modified Dazzler type board with just the features we use."

Ultimately, they hope to mass produce an inexpensive machine. Thus to find a good backgammon opponent, you will only have to go as far as your nearest penny arcade (better make that quarter arcade.)

But for now they have an eye-catching prototype which even includes a slot for money. For each quarter deposited, the user gets 150 button presses and then must deposit another quarter. When not playing backgammon, the video display projects beautiful moving kaleidoscope-like color patterns. This is accomplished by a program written by Steve and Danny called "Mandala", which we hope to feature in an upcoming issue of *Interface*.

The game simulated by Jack is quite realistic. The excitement of the doubling cube, good and bad dice rolls, last minute victories are all part of playing against Jack. By selecting one of Jack's ten levels of skill, anyone can get a fast, fair, and challenging game. Even Steve, who says he has never been an avid gameplayer, keeps a box of quarters near Jack. He has a very hard time passing without "rolling the dice" for a few games.

THE 1976 COMPUTER

STORE ALL-STARS

Mike Eusey

Steve Zook

Paul Tripe

John Trotter

Jim Modecki

Dick Heiser

The most experienced computer dealers anywhere

THE COMPUTER STORE

820 Broadway
Santa Monica, Calif. 90401
Phone (213) 451-0713

altair™ COMPUTER CENTER

Authorized dealer for:
MITS, Southwest Technical, Polymorphic, Cromemco, Microterm, Oliver, TDL, Sanyo
BY POPULAR DEMAND! NEW HOURS!! TUES – FRI Noon - 8 p.m., SAT 10 a.m. - 6 p.m.
Located 2 blocks North of the Santa Monica Freeway at the Lincoln Blvd. exit

Circle No. 12 on Inquiry Card

VTL/2: A Very Tiny Language

By Gary J. Shannon

Gary Shannon
may be reached at:
18411 Vincennes
Northridge, CA 91325

If you assume that in order to run significant programs in a higher level language you need 8-12 k of memory and a BASIC interpreter, you will be interested to learn of Gary Shannon's Very Tiny Language. The interpreter for Gary's language resides in 768 Bytes of ROM and the language is very terse, making it possible for a significant program to fit in a 1k or smaller RAM. The terse notation also pays off in terms of fast execution, and in spite of its size, VTL has some very powerful features.

Of course, by opting for a very compact language, Gary has paid a price–don't expect your VTL programs to be very readable and don't look for lots of diagnostic messages from the interpreter. You too will pay a price if you wish to buy a VTL chip set for the Altair 680–it sells for $114.00 at your local MITS dealer. Just before going to press, we learned that 8800 chip sets are also available at $114.00 for 270X's or $149.00 for 2702's.

If you wish more information, you can get a copy of the 27 page VTL/2 language manual by sending $2.00 to Dick Heiser, The Computer Store, 820 Broadway, Santa Monica, California 90401. Be sure to specify 8800 or 680.

Gary began building home computers out of relays and tubes while in high school. He has been a professional systems programmer for 13 years. At the time this article was written, he was an employee of the Computer Store, and therefore had a commercial interest in VTL.

So you've built your Altair 680, now what? Let's face it, there's not much you can do with only 1K of memory. That's not enough room for BASIC, or even for an assembler. But wait a minute. I know one user who is running a small billing system on his 1K 680. Another, a college professor, is doing complex matrix manipulations on archeological data. These sound like serious applications. Surely no one is taking the 680 seriously!

Well, if that's what you think, then think again. All over the country hundreds of 680 owners are taking their tiny 1K systems very seriously. Their secret is VTL/2, a Very Tiny Language for the Altair 680. This language gives the user the capabilities of BASIC, yet requires only 768 bytes of read-only memory.

Having a language in PROM is the ultimate in convenience. Each time the system is turned on, the interpreter is right there, ready to use, with no time wasted in loading. By way of contrast, 8K of hex format paper tape requires over 20 minutes to load from a slow cassette.

Not only does the interpreter itself use up very little space, but the VTL programs themselves are very compact. You might call it a "smallified BASIC". To begin with, in place of the key-words used in BASIC, VTL uses single character abbreviations for such functions as INPUT, PRINT, GOTO, GOSUB, RETURN, IF, RND, FRE, USR, and for array or string array references.

Variables may be represented by any single alphabetic or special character. Most of these are available for the user to define as he wishes. Some of them, however, have very special meanings. These are called "system variables".

The system variable *pound sign* (#), for example, will always contain the line number of the program line currently being executed. If nothing is done to this

Computer Music Symposium

Presented by
Southern California Computer Society:
February 19, 1977
at
Orville Wright School
Westchester, California
9:00 to 12:00
Computer Vendors
and Manufacturers Representatives
PROGRAM:
12:00
William S. Sinclair, Chairman
12:10
Dr. Philip Springer &
Dr. Ray Jurgens
"Basics of Electronic Music and Computer Applications"
12:50
Dr. Prentiss Knowlton
"Interfacing Computers to Traditional Musical Instruments—Organ and Piano"
1:20
Jim Gordon
"A Computer-programmed Percussion Synthesizer Using An IMSAI 8080"
1:45
QUESTIONS AND BREAK
2:30
Dr. Leland Smith &
Prentiss Knowlton
"Computers as Applied to Music Graphics and Swing"
3:15
Wm. S. Sinclair
"Computer Enhancement of Live Performances"
3:50
QUESTIONS AND BREAK
4:15
Dr. John B. Chowning
"Computer Generation of Sounds and Music by Digital Techniques"
5:15
Dr. Justis Matthews
"Use of Buchla Synthesizer System in Music Composition"
6:00
Jerome Wenker
"Computer Analysis of Folk Tunes"
6:30
CONCLUSION OF THE SYMPOSIUM
Tickets may be reserved by sending $4.00 per seat with a self-addressed, stamped envelope to ensure proper return of tickets.
Reservations should be sent to:
The SCCS Program Committee
Box 54751, Los Angeles, Ca. 90054

Circle No. 13 on Inquiry Card

VTL/2

variable, it will advance to the next line number in the program after each line is executed. If, however, the statement changes the value of "#", the next line executed will be the one whose number was placed into "#". In other words, "#=300" means "GOTO 300". The only exception to this rule is that if the result placed in "#" is zero, that value will be ignored, and the next line in the program will be executed. This fact allows us to "calculate" an IF statement in VTL/2. Consider this example:

```
10 X=1              (sets X to 1)
20 #=(x=25)*50      (if X=25
                     goto 50)
30 X=X+1            (add 1 to X)
40 #=20             (goto 20)
50...               (continue)
```

Notice that "X=25" is a *logical expression* which has the value *one* if it is *true* (i.e. if X is equal 25) and *zero* if it is *false* (i.e. if X is not equal 25). When this "logical" value is multiplied by 50, the result must be either zero or 50. If it is 50 the statement causes a "GOTO 50" to be executed. If it is zero, a "GOTO 0", which is a dummy (NOP) statement falls through to the next line in the program.

Every time the value of "#" is changed to some non-zero value, the original value plus one is saved in another system variable, *exclamation point* (!). The variable "#" can be used for both "GOTO" and "GOSUB", since the statement "#=!" means "go back to where you came from plus one line". This is the VTL/2 "RETURN" statement.

The system variable *question mark* (?) represents the user's terminal. It can be either an input, or an output depending on which side of the equal sign it falls. The statement "?=A" means "PRINT A", and the statement "X=?" means "INPUT X". Since "?" is a variable, it may appear anywhere in a statement, so that "R=(?+?+?)/3" will call for three numbers to be input, and will put their average in the variable "R". In response to a request for input, the user may type a number, a variable name (whose value will be the value used), or an entire VTL/2 expression!

For games and simulations, the system variable *apostrophe* (') represents a different random integer between 0 and 65535 every time it is called. if your game (or simulation) program requires a number in some other range, the statement "R='/(Y−X+1)*0)+%+X" produces a random integer between X and Y. (Notice that the system variable *percent sign* (%) always contains the remainder after the most recent integer divide.)

In addition to decimal input and output, the system variable *dollar sign* ($) is used to input and output ASCII string data. This is accomplished by allowing any variable (or array position) to contain either a numeric value, or a single ASCII character. This dual purpose even allows you to perform computations on character data as if they were numeric. Add one to the character "A" and the result is the character "B". As an example:

```
10 A=65
20 $=A
30 A=A+1
40 #=A<91*20
50 ?=""
```

The above program will print out a continuous string of letters, each of which is one greater than the one before it. Since 65 is the decimal value for the letter "A", and 90 is the letter "Z", the actual output would be "ABCDEFGHIJKLMNOPQRSTUVWXYZ". Statement 50 then prints a carriage return.

Any memory remaining after the end of the program may be used as array storage. The array does not need a name, since there is only one, but it can be divided up as required, and appropriate subscripts calculated. A subscript expression is identical to any other VTL expres-

sion except that it begins with a *colon* (:) and ends with a right parenthesis. This subscript expression may appear anywhere that you would otherwise use a variable name. For example:

```
10 :1)=0      (zero first array loc.)
20 I=1        (set subscript to 1)
30 :I+1)=:I)+1  (put next higher
                number in next
                array position)
40 I=I+1      (bump subscript)
50 #=I<101*30   (loop back
                till I=101)
```

Since subscripts refer to two-byte words in memory, it is possible for large valued subscripts to "wrap around" memory and clobber the VTL/2 source program itself. On the other hand, this also means that clever programs could modify themselves. (Very carefully, of course!)

There are no error messages in VTL/2. If an expression is wrong, the results of executing the instruction will be unpredictable. In other words, VTL expects you to know what you're doing, and will do its best to execute any statement you give it. This gives you wide latitude for trying various programming "tricks", but also leaves you, the user, with the responsibility of verifying program accuracy.

In addition to the features discussed here, VTL/2 has provisions for user defined machine language subroutines, printing string literals, *control-C* (cancel), and *control-A* (suspend). Pointers available to the user as system variables make it possible to compute memory addresses, and "PEEK", or "POKE" to those locations. Similarly, memory sizes and free space may be easily computed from system variables.

The structure of VTL/2 by no means limits you to 1K in your system. The interpreter will handle any size memory up to 63K. (1K must be reserved for PROM.)

How about speed? VTL/2 benchmark programs have run 20-30% faster than 8800 disk extended BASIC. Keep in mind that this speed increase is in spite of the fact that the 8800 system clock runs twice as fast as the 680 clock! The speed of 8800 VTL/2 (yes, it is available for the 8800) is even greater.

By now, most Altair dealers should have the VTL/2 PROMs in stock, so isn't it about time you began to take your 680 seriously?

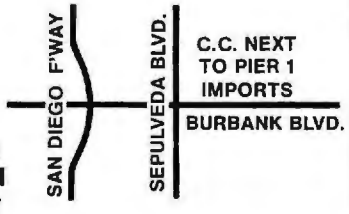
213-786-7411
10-9 Tue.-Sat.
Closed Monday

CCI

COMPUTER COMPONENTS
5848 Sepulveda Blvd., Van Nuys, CA 91411

Used Memorex Keyboard
Full ASCII Upper & Lower Case
Single +5V Power Supply 800ma.
With Complete Schematics

$45.00
Limited
Supply



WE CARRY THE FOLLOWING PRODUCT LINES

IMSAI
Polymorphic
Systems
Cromemco
Tarbell
TDL
Solid State
Music
KIM I
Vector
Terminal Systems
Continental
Specialties

IMSAI 100 Pin Connectors: $5.00

DB25P: $2.00 DB25S: $3.00

T.I. Low Profile IC Sockets

	1	10		1	10
8 Pin	.30	2.50	20 Pin	80	6.00
14 Pin	.25	2.00	22 Pin	50	4.00
16 Pin	.27	2.20	24 Pin	50	4.00
18 Pin	.40	3.20	28 Pin	50	4.00

KEYBOARD Encoder AY-5-2376: $10.00

TERMS: Orders over $25.00 prepaid.
Add $1.00 for collect orders. Orders under $25.00 add $2.00 for P.&H.
California residents add 6% Tax.

FEBRUARY SPECIALS
Good Thru 2-28-77

8T97B	$1.00
91L02A	$2.00
2708 (Unmarked, Tested)	$35.00
74200 (House Number)	$2.00
8 Position DIP Switch	$2.00

PRODUCTS

TTY Paper
8 Level
Punch Tape
8-1/2 X 11; 11 x 14
Fan Fold
Floppy Disketts
Soft & Hard
TTL, CMOS
Integrated Circuits
Resistors, Capacitors

Circle No. 14 on Inquiry Card

Personal Computing

Greatest Computer Shows Ever!

Personal Computing magazine is proud to announce that it is sponsoring the first series of regional Personal Computing Shows.

Beginning with the *Western Personal Computing Show* in Los Angeles, and followed by the *Eastern Personal Computing Show* in Philadelphia and the *New England Personal Computing Show* in Boston, **Personal Computing** magazine intends to make everyone aware of low-cost computing.

Other shows are now being planned for the South, Southwest, Canada, and Europe!

Already, invitations have been sent to all the manufacturers in the personal computing field, computer stores, computer clubs and well-known computer experts.

Special areas of the exhibition halls will be set aside for Personal Computing in Education, in the Home, in HAM Radio, and in Small Businesses. These are all first for a computer show.

Seminars and special presentations include: Computer Synthesized Music, HAM Applications, Trends in Microcomputers, Mass Storage Systems, Lemonade Computer Service Companies, The Kitchen Computer, Computers on the Farm, The Small Business System, Software for Fun and Practical Applications, Computer Club Organization, Standards for the Hobbyists, Computer Art, The House Robot, Computer Crime, Software Protection and Future Computing.

In addition, *special tutorial workshops* will cover all aspects of computer hardware, programming in both machine language and higher-level language and applications. Workshops are designed for both beginners and advanced students in the art of personal computing.

We anticipate 150 different exhibits and crowds of up to 10,000 people at each of these shows. Arrangements for the shows are being handled by a professional management company to ensure that everything runs smoothly.

Cost of Registration:

At the door:
- $10 per show (two days)
- $ 6 per One Day Pass

Special Pre-Registration Rates:
- $ 7.50 per show (two days)
- $ 4.00 per One Day Pass

Note: Show tickets and one day passes entitle you to attend all seminars, workshops, exhibits and other events.

Register Now and Save!

Yes, I would like to take advantage of your special, pre-registration rates. I plan to attend the following regional Personal Computing Show(s):

☐ Los Angeles	☐ Philadelphia	☐ Boston
☐ Show (two days)	☐ Show (two days)	☐ Show (two days)
☐ One Day Pass Only	☐ One day pass	☐ One day pass

Enclosed is a check for _____

Name _____

Address _____

City _____ State & Zip _____

Send to: **Personal Computing**, Conference & Exposition Management Co., Box 844, Greenwich, CT 06830.

Special Discount for SCCS Members Only

Another benefit for SCCS members. If you are not a member and wish to take advantage of this offer send your name, address, and $10 for annual dues and SCCS Interface magazine.
Offer valid only if mailed before March 1, 1977 to SCCS, Box 54751, Los Angeles, California 90054 with stamped, self addressed envelope.

	Registration at door	Pre-registration	SCCS Member pre-registration
2 days	$10.00	$7.50	$6.00
1 day	6.00	4.00	3.00

Circle No. 15 on Inquiry Card

Science Fiction Corner

The Subject Is Robots

By Lew Whittaker

I have always been fascinated with the idea of the creation of artificial life. This fascination encompasses the dated setting of "Frankenstein" by Mary Shelley, to bizarre and futuristic creations like Hal in the movie "2001". The concept of man creating artificial life in his image is not a new concept. Every civilization in every age has fantasized that by mixing the right chemicals or spouting the proper incantations, a piece of lifeless protoplasm could rise and serve as a tool of mankind. This is typically described in early Hebrew folklore whereby it was felt that a 'GOLEM', a giant mechanical monster, would arise to smite the unbeliever.

Whether through independent creation or through feeding and embellishing on earlier legends, the stories of mechanical creations have not only survived to modern times, but through the popularity of science fiction, have flourished. Cyborgs, Androids, Humanoids, Robots have populated not only the written pages of modern literature, but they have also made their presence felt in the newer media forms such as radio and television. Examples of these are Orson Welles 1939 radio thriller "War of the Worlds", television's "Bionic Man" and this season's forgettable comedy series "Holmes and YoYo". (YoYo is a robot) Fortunately, in written literature, there are some better examples of Robot creation than is presently to be seen on television. Two works that I feel should be on every reading list on the subject of Robots are, *R.U.R.* a short play by Karel Capek, and *I, Robot* a novel by Isaac Asimov.

R.U.R. (Rossum's Universal Robot) was written in 1920 and was first produced on stage in Prague, Czechoslovakia in 1922. It was a smash hit and was rapidly shown throughout Europe and the United States. The prime significance of this play is that it donated the word ROBOT to the world. This is a contraction of the Czech word robota, a noun meaning work. Thus ROBOT, something that performs jobs of work. The play is a fascinating short fantasy about a company which mass produces robots in order to fill a world wide labor need and in order to make a better life for all human beings. Being efficient, the robots gradually move into every area of human endeavor, pushing aside the less efficient human creatures. Having completed the takeover of human production, the robots now organize and proceed to eliminate the unnecessary and unproductive human population. Besides being an entertaining and humorous play, *R.U.R.* is an attack on the ruthless and relentless struggle for profits in a capitalistic society. Rossums factory could not slow its production of robots even knowing that by continuing to produce, it was destroying not only itself but all of mankind. Although it might now be considered dated or even naively written, it still has a certain charm and must be considered a classic.

I, Robot is a novel, or rather a linked series of short stories by Isaac Asimov. This also deals with a company which manufactures Robots. In this case, the company is THE U.S. ROBOT AND MECHANICAL MEN CORP., the IBM of the robotics industry. Asimov is far more technically oriented than was Capek and while some of his stories are pretty far out, they have a ring of plausibility about them. Each of his story segments deals with either new prototype robots, robot malfunctions or robots acting in unusual situations. After reading about a number of bizarre malfunctions that must be diagnosed and corrected, it becomes quite evident, if not reassuring, that computer hobby kits are not the only devices delivered with built in bugs.

The main contribution of Asimov and *I, Robot* are the three laws of robotics which have been carried through in some degree to a great number of science fiction stories about robots. These three laws are:

1. A robot may not injure a human being, or through inaction, allow a human being to come to harm.
2. A robot must obey the orders given to it by human beings except where such orders would conflict with the first law.
3. A robot must protect its own existence as long as it does not conflict with the first or second law.

While there are many more excellent stories in modern literature dealing with robot technology, these are two that I enjoy and feel have specific significance. If anyone has a particular favorite that I didn't include, pass it along to me and I will try to share it with our readers.

New Products

Until getting into Interface, we never understood the role of new product announcements in magazines. The announcements, along with bingo card responses are used to solicit paid advertising.

We will frankly follow this practice ourselves; however, we intend to do more. We also see the New Products section as an important avenue of exposure for new, small ventures which are unable to pay for ads at commercial rates. As such, we would like new product announcements (hardware, software, books, services, etc.) from people who are just starting as well as from the established firms. We will consider the interest of the product, not the likelihood of selling an ad in allocating our space.

Complete Floppy Disk System for Altair/IMSAI: $599

Circle No. 16 on Inquiry Card

The North Star MICRO-DISK SYSTEM is a complete, high performance floppy disk storage system for use with any Altair/IMSAI compatible computer. The introductory price of $599 includes all hardware and software needed to turn on the computer and start loading or saving programs and accessing on-line data files.

The disk unit is a compact version of the standard Shugart floppy (30,000 sold!). Drive capacity is 90K bytes per diskette. Latency is 100ms. Track to track access is 40ms. The size of the unit (6" by 3" by 8") permits mounting of the drive inside the computer cabinet with specified cutout. The power supply requirements (.5 amps at +5 volts and .9 amps at +12 volts) permit utilization of the existing computer power supply. If preferred, a cabinet and power supply are available.

The North Star controller is a single Altair/IMSAI compatible PC card which can control up to three drives. An on-board PROM contains power-on bootstrap software. The controller operates with or without interrupts.

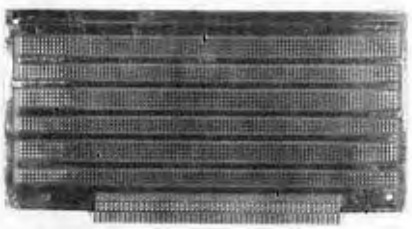
A file-oriented disk operating system and a disk version of North Star extended BASIC are included. North Star BASIC has multiple-dimensioned arrays, strings, multiple-lined functions, formatted output, machine language interfacing, sequential and random disk file accessing, and much more.

The $599 introductory price covers: The North Star controller kit (highest quality PC card and components, with sockets for all IC's), the Shugart mini-floppy drive (model SA-400), disk-to-controller cabling and connectors, two diskettes (one preloaded with the software), complete hardware and software documentation, and shipping. Additional drives are $425 each, including cables. Diskettes are $4.50 each.

Delivery begins in January. Orders are now being accepted, either cash in advance or 25% deposit with balance payable C.O.D. (including C.O.D. charges). Write North Star Computers, Inc., 2465 Fourth Street, Berkeley, CA 94710. Telephone 415-549-0858.

The Mini-Shugart drive has been out for a while, but these fellows seem to be the first to get the whole package together. The price seems very right (they tell me that it will go up in February), they have DOS and disk BASIC up, and are into production.

Editor



Tarbell Electronics Model 1010 Prototype Board

Circle No. 17 on Inquiry Card

The Tarbell Electronics Model 1010 Prototype Board for the Altair and IMSAI computers is much better than other available boards. This board accepts up to 33 14-pin IC's, or a mixture of 40-pin, 24-pin, 18-pin, 16-pin, and 14-pin IC's. It is mainly oriented toward soldering point to point, but wire-wrap may also be used. There are three rows for IC's. The IC's or sockets are inserted from the top, then wires are soldered to the adjacent tabs. The tabs are such that even with 40-pin IC's, there are still two holes left over on each pin for wires. A place for a 5-volt regulator is also provided. Edge pins are gold-plated. The price is $28. TARBELL ELECTRONICS, 144 Miraleste Drive #106, Miraleste, Calif. 90732 (213) 538-4251.

Utility Subroutine Package

Circle No. 18 on Inquiry Card

The UT1 subroutine package is a collection of commonly used microcomputer subroutines written in 8080 assembly language. By providing many commonly used I/O routines and code conversions

the package helps to reduce the size of source programs. The routines occupy less than 3/4K of memory, and ideally they will be located in a PROM or EPROM.

The Subroutines are as follows:

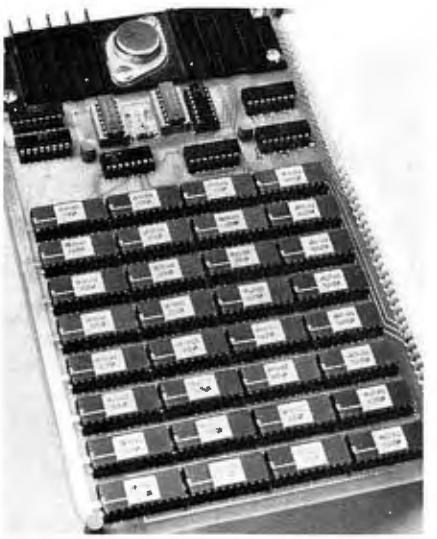
FUNCTION
Console character input
Console character output
Console input and echo
ASR reader character input
Parallel reader input
Parallel punch output
Parallel printer output
Input 8 bit hex number
Input 16 bit hex number
Input 8 bit octal number
Input 16 bit octal number
Input 8 bit decimal number
Input 16 bit decimal number
Input 2 BCD digits
Input 4 BCD digits
Output 8 bit hex number
Output 16 bit hex number
Output 8 bit octal number
Output 16 bit octal number
Input character string
Output character string
Output CR, LF
Convert ASCII byte to hex nibble
Convert hex nibble to ASCII byte
Convert BCD number to hex
Convert 16 bit hex number to BCD

Prices are as follows:

Source Listing (16 pages)	$3.00
Source paper tape	$6.00
Object paper tape	$3.00
Source listing and source tape	$8.00
Source listing and object tape	$5.00
Source listing, source and object tapes	$10.00

Plus .25 postage. California residents add 6% sales tax.
Pragmatic Systems, P.O. Box 43, Mountain View, California 94042

This looks like useful software, priced right. This sort of pricing is one answer to the software stealing problem. No one would risk the Karma damage for $3-$10!



16K Board For Your SWTPC 6800

Circle No. 19 on Inquiry Card

The Smoke Signal Broadcasting M-16 is a 16,384 x 8 bit semiconductor random access memory system completely contained on a single printed circuit card assembly. It is plug compatible with the Southwest Technical Products Corporation 6800 microcomputer and allows expansion to 32K without any modifications. Expansion to 48K is possible with a simple modification to the SWTPC 6800.

The M-16 uses AMD 9141ADC static memory chips and is fully buffered. The system requires just one 8 volt power supply and draws approximately 1.8 amps (which is less than half the power requirement of a similar size system constructed with 2102's).

Measuring 5-1/2" x 9", the M-16 is the same size as the SWTPC 6800 CPU and memory boards. It combines speed sufficient to run the SWTPC 6800 at full clock speed with very compact design at a surprisingly low cost. This is the first of a number of products designed by Smoke Signal Broadcasting to make the SWTPC 6800 a truly complete, low-cost computer system.

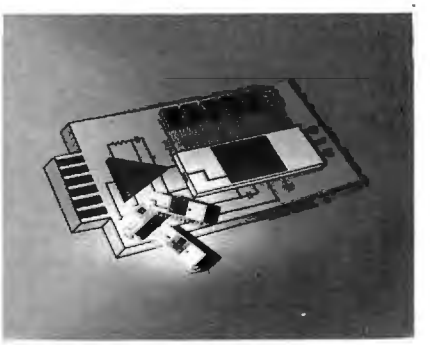
The M-16 is priced at $595 and delivery is from stock. Smoke Signal Broadcasting, P.O. Box 2017, Hollywood, California 90028, (213) 462-5652.

Punched Tape Duplication Service

Circle No. 20 on Inquiry Card

Western Numerical Control will punch and verify one tape or your entire library of paper tapes on the tape of your choice. Prices range from 4¢/foot/pass to 22¢/foot/pass depending on the type of tape and whether the customer or WNC supplies it.

Contact Western Numerical Control at: 1400 Coleman Ave. -C27 Santa Clara, Calif. 95050 (408) 296-2314 or 17911 Sky Park Cir. -B Irvine, Calif. 92714 (714) 751-1363.



New Low Cost 4½ Digit A/D Converter Pair from Intersil

Circle No. 21 on Inquiry Card

A new low cost digital processor, the 7103, being introduced by Intersil, Inc., combines with Intersil's 8052 signal conditioner to provide all necessary logic circuitry for a ±1999 count analog-to-digital counter. "A" versions, 7103A and 8052A, provide circuitry for a ±19999 count instrument. Both pairs provide a multiplexed BCD output suitable for LED displays.

Intersil has also announced an across the board cut in prices of their clock and stopwatch chips.

Intersil, Incorporated, 10900 North Tantau Ave., Cupertino, Ca. 95014, (408) 996-5000.

Continued to page 56

THE FIRST WEST COAST COMPUTER FAIRE

A Conference & Exposition on Personal & Home Computers

San Francisco Bay Area—where it all started—finally gets its act together.

7,000-10,000 PEOPLE ▪ 100 CONFERENCE SESSIONS ▪ 200 COMMERCIAL & HOMEBREW EXHIBITS

2 BANQUETS ▪ SPECIAL INTEREST SOCIAL CENTERS

San Francisco Civic Auditorium, Northern California's Largest Convention Facility

YOU Can Be A Part Of It:

▪ *Some* of the things *you* can do are:

Exhibit a Homebrewed System
- Hardware or Software
- Prizes for Best "Homecooking" (just like a country fair)
- Nominal Grants-In-Aid Will Help With Exhibit Transportation Costs (grants will be refereed)

Present a Talk
- A Formal Paper
- An Informal Talk

Serve on a Panel
- As a Panel Member
- As the Coordinator/Moderator

Offer Suggestions
- Topics for Talks & Panels
- Speakers & Panel Participants
- Interesting Exhibits (homebrewed or commercial)
- Special Activities

▪ *Quick*, write or call for more details!
Jim Warren, Faire Chairperson
Box 1579
Palo Alto CA 94302
(415) 851-7664 v 323-3111

▪ *Some* of the **Conference Sections** being planned:
- Computer Graphics on Home Computers
- Computer-Driven, & Computer-Assisted Music Systems
- Speech Synthesis Using Home Computers
- Computers & Amateur Radio
- Microprogrammable Microprocessors for Hobbyists
- Program & Data Input via Optical Scanning
- Floppy Disc Systems for Personal Computers
- Computer Games: Alphanumeric & Graphic
- Computers & Systems for Very Small Businesses
- Personal Computers for the Physically Handicapped
- Personal Word-Processing Systems
- Software Design: Modularity & Portability
- Personal Computers for Education associated with a Univ. of California short-course
- Several Sections Concerning Standards
- Other Sections for Club Leaders, Editors, Organizers, etc.

▪ **Co-Sponsors** include amateur, professional, & educational groups:
- The Two Largest, Amateur Computer Organizations
  Homebrew Computer Club
  Southern California Computer Society
- Both Area Chapters of the Association for Computing Machinery
  San Francisco Peninsula Chapter & Golden Gate Chapter
- California Mathematics Council
- Stanford University's Electrical Engineering Department
- Community Computer Center
- People's Computer Company

april 15-17, 1977 · san francisco

©76-10-13 BY COMPUTER FAIRE

Discount For SCCS Members

Registration at the door	Pre-registration	SCCS Member
$9.00	$8.00	$7.00

To receive a pre-registration form, send the address label from your copy of *Interface* or a copy of it to:
Box 1579, Palo Alto, California 94302.
Do *not* enclose a payment.

Circle No. 22 on Inquiry Card

A Symposium On The Whatever-It's-Called 100 Pin Bus*

Is this the Last Supper? Is it the Altair Bus? No, it's the panel of experts at the S-100 Bus Symposium. From left to right: Joe Killian of IMSAI, Howard Fuhner of Parasitic Engineering, Carl Helmers of *Byte*, Jef Raskin himself, Dave Dutra of Dutronics, Bill Godbout of Godbout Electronics, John Stevenson of Polymorphic systems and moderator Jim Warren of *Dr. Dobbs Journal*.

The first in a series of "S-100 Symposia" was held recently at Diablo Valley College in Northern California. The symposium was concerned with the viability of the Altair bus for serious commercial and professional applications.

Talks were given by Dr. Harry Garland of Cromemco, and George Morrow and Lee Felsenstein, both designers of equipment using the bus. After their talks, a panel discussion moderated by Jim Warren of Dr. Dobb's Journal was held.

The general consensus was that the Altair bus was viable, if imperfect, and that its wide adoption was an important factor in the growth of our industry. Only once was there a strong objection to this view, and it came from the audience, when a questioner asked whether it might not be better to design a correct standard now rather than three years from now when there are 100,000 microcomputers in use rather than 10,000 (his remark got a lot of applause).

We personally found the symposium most interesting, but like the man mentioned above, would have liked to see some anti-standard people on the panel. Only Altair bus manufacturers were represented, and we hope that the next symposium in this series will feature speakers from companies such as Ohio Scientific and the Digital Group.

The next symposium is scheduled for the April Computer Faire in San Francisco and if you can make it, we would really recommend attending it.

The following are paraphrases of some of the more memorable remarks made during the symposium. We won't try to attribute them to single individuals because they were often repeated many times.

- Do you spell bus with one "s" or two?
- The Altair bus is not simple. They included every signal they could think of, which makes it easy for the peripheral designer but difficult for the designer of CPU boards.
- A number of problems are due to the physical implementation of the bus as opposed to the logical definition of the various signals.
- It should be required that data is transferred by strobing (using DBIN on the 8080) rather than whenever addresses match.
- Life is what happens to you when you are making other plans–the hobbyist made the standard.
- Front panels are unnecessary–a PROM-based debugging monitor is much better.
- Front panels are indispensable for maintenance and debugging.
- Signals which are dedicated solely to the front panel should not be on the bus.
- Hobbyists can deal with hardware now because it is so simple with large scale integration.
- We should reflect the microprocessor definition and provide for a bidirectional data bus.
- The Altair bus is suitable for a 16-bit machine–just use a bidirectional data bus.
- Standards should be created through communication in magazines.
- This or any standard is a point of reference, relative to which one should merely document their differences. ANSI standard Fortran is used in this manner.
- Levels of implementation are needed–standard subsets of the Altair bus signals.
- Noise immunity standards are needed as well as signal usage definitions.

---

*What should it be called–"S-100", "Altair", "Altair/Imsai/Polymorphic/SOL/Compal/Cromemco/etc"?

This question seems to be getting a lot of attention these days. MITS feels that it is the "Altair" bus, because they designed it. The people who convened this symposium obviously feel that "S-100" is best because it is a standard used by many manufacturers.

Unless our members give us a lot of static, we will call it the "Altair" bus by process of elimination.

We are uncomfortable with "S-100" because it implies that this is and should be a standard and in the eyes of some folks, this "standardization" is premature. We eliminate the "Altair/..." designation because the list is getting ridiculously long.

So, we're left with "Altair" until someone comes up with a better name. It is our personal feeling that the best solution might be a nice ego-less name like "Unibus".

Computer Store Survey

By Larry Press

PCC and SCCS Interface Magazine recently sent a questionnaire to computer stores across the country – it was a joint effort (PCC paid for the printing and Interface for postage) and is being reported on in both magazines. Any store which would like to be included in our next survey and added to our oft-published, good-publicity list should contact Larry Press, P.O. Box 5429, Santa Monica, CA 90405.

I recently sent a questionnaire survey to computer stores in order to get a feel for what sorts of services they offer, who their customers are, and what sorts of things they are doing in the areas of school and business applications. I have received replies from 35 stores and will summarize the results here.

The first question to be dealt with is: why were there only 35 replies? One possible answer is laziness; however, I believe that many of the stores being only a few weeks old is also a factor here since they had little to report. Furthermore, a number of the "stores" on our (and other's) list are not stores but OEMs or mail order stores for whom the survey was inappropriate.

So much for those who didn't reply, how about those who did? The first area the survey dealt with was schools. We asked if elementary or secondary schools in their areas were using micros (23% said "yes") and if any schools were assembling kits (20% said "yes"). We also found out that only 1 store was offering classes for teachers in their area and that 49% were interested in materials to support classes for teachers (authors take note).

The next area of interest was the customers of the stores. We asked people to break down their CPU sales into several categories and received the following response:

	Overall Percent	Range
Hobbyists	62%	6-80%
Business	15%	5-82%
Professionals	14%	5-75%
Schools	9%	0-25%

It appears that some stores are hobbyist oriented and others slant their efforts toward systems for business. Seventeen percent make over half of their sales to business and 40% make more than half of their sales to individuals (hobbyists and professionals).

The average number of CPU sales reported was 48 per store. Half of the stores responding have sold 10 or fewer CPUs and sales ranged from 0 to over 250. A number of stores (large and small) declined to give the absolute numbers, but only reported percentages. It is still early and many of the stores in the "under ten CPU" group may be just opened, or it may be that the public is not yet ready to support retail computer stores outside of high technology urban areas.

I was surprised to learn that book sales account for an average of only 8% of the business in the stores carrying them and that many do not even carry books. Furthermore, computer store customers buy few tools (perhaps because they're not stocked) and, except for the cases where computers are a sideline at an electronic supply store, components are not very hot items.

Another focus of the survey was the services available at stores. This is what we found with regard to the percent of stores offering various services:

Service	Percent of Stores
Programming services	49
Maintenance	46
Systems analysis services	43
Software classes	37
Space for local clubs	29
Construction classes	17
Electronic theory classes	9
Chocolate chip cookies	3
Service bureaus	3
PROM burning	3
Leasing	3

Finally, several questions dealt with the development of business applications software. We found that 54% of the stores knew of business software projects and that 43% are doing some sort of business software development themselves. About 23% seem to be fairly serious about their business software development. Disc based systems predominate, though a few

are working on tape as well.

The following tables summarize the activity reported in development of business oriented software:

Industry Packages	Percent of Stores
Doctors offices	11
Accountants	11
Lawyers offices	9
Dentists offices	9
Manufacturing companies	9
Engineers	6
Retail stores	6
Retail businesses	6
Service businesses	6
Distribution companies	3
Data processing services	3
Industrial control	0

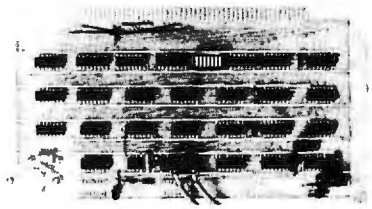
Management Information Systems	Percent of Stores
Production control	9
Finance	3
Marketing	3
Planning	3

General Business	Percent of Stores
Payroll	26
Accounts Receivable	26
Accounts payable	26
Inventory control	26
General ledger	23

General Purpose	Percent of Stores
Word processing	14
Program file management (disc)	14
Data file management (disc)	11
Sort and merge	6
Utilities	6
Program file management (tape)	6
Data file management (tape)	6

A few of these packages are being developed either by end users or by independent programmers acting as consultants, but the great majority are being developed by the stores themselves.

That's it for now—we'll follow up with another survey soon.



The Tarbell Cassette Interface

- Plugs directly into your IMSAI or ALTAIR
- Fastest transfer rate: 187 (standard) to 540 bytes/second
- Extremely Reliable—Phase encoded (self-clocking)
- 4 Extra Status Lines, 4 Extra Control Lines
- 25-page manual included
- Device Code Selectable by DIP-switch
- Capable of Generating BYTE/LANCASTER tapes also.
- No modification required on audio cassette recorder
- Complete kit $120, Assembled $175, Manual $4

TARBELL ELECTRONICS

20620 S. Leapwood Ave., Suite P, Carson, CA.
(213) 538-4251
California residents please add 6% sales tax

Circle No. 23 on Inquiry Card

THE PROM SETTER

WRITE and READ EPROM

1702A and 2708

- Plugs Directly into your ALTAIR/IMSAI Computer
- Includes Main Module Board and External EPROM Socket Unit
- The EPROM Socket Unit is connected to the Computer through a 25 Pin Connector
- Programming is accomplished by the Computer
- Just Read in the Program to be Written on the EPROM into your Processor and let the Computer do the rest.
- Use Socket Unit to Read EPROM's Contents into your Computer
- Software included
- No External Power Supplies, Your Computer does it all
- Programs and Reads Both 1702A and 2708 EPROMS
- Doubles as an Eight Bit Parallel I/O
- Manual included

INTRODUCTRY OFFER*

Kit Complete — $135 (Normal Price $165)
Assembled — $245 (Normal Price $275)

*Special Price Good Only Until March 31, 1977
Delivery Less than 90 days

SZERLIP ENTERPRISES

1414 W. 259th St. — Harbor City, California 90710
California residents please add 6% sales tax

Circle No. 24 on Inquiry Card

Helpful Hints, or What I Had To Learn To Build a Computer

Nuts and Volts

By Tricia Wood

Electricity is a form of energy we use every day. Electrical energy can be regulated and controlled much more easily than most other forms of energy. One of its particular advantages is its utilization at points remote from its generation; it can be transmitted over very large distances readily and economically.

The generation, control, and transfer of electrical energy requires certain apparatus. Energy converters (or transducers as they are called) include such devices as generators, motors, loudspeakers, etc. Some transducers convert mechanical, chemical, or thermal energy directly or indirectly into electrical energy. Others convert electrical energy into mechanical energy for industrial, communication or household uses. Transducers also convert electrical energy into sound for the reproduction of speech and music; into chemical energy for electro-chemical processes; into light for illumination and television; into thermal energy for industrial and household furnaces and miscellaneous heating devices. In electrical circuits, electrical generation and loads (the devices that use the energy) along with the control and measuring devices are connected physically by wires.

Electric current flow is caused by the motion of electric charges in the wires of the circuit. The coulomb is the basic electric charge unit. One electron has a charge of 1.60 X 10-19 coulomb. Electric current represents the transport of electrical charge (electrons) in any given time. We may define an electric current as the time rate of motion of electric charge across any cross sectional boundary. We also define the ampere (the fundamental link between the mechanical quantities) as the rate of flow of one coulomb per second across any given cross section.

A current is said to be continuous if it does not change in magnitude with time. A direct current may change in its magnitude with time even though it never changes its direction; such a current is also known as a pulsating direct current. An alternating current is one that alternates periodically with time, changing both its magnitude and direction in a regular periodic fashion. An alternating current is said to have the same waveform in every period.

Whenever an electric current flows, it is accompanied by an interchange of energy. When a neutral, (uncharged) conductor is placed close to a charged body (an electron), some of the electrons flow to the neutral conductor until equilibrium is established. If the charged body carries a positive charge some electrons in the neutral conductor will be attracted and will concentrate in that part of the conductor which is closest to the charged bodies, one negatively and the other positively charged; a flow of electrons takes place momentarily in the conductor. If the conductor is allowed to make contact with both charged bodies, the electrons of the conductor nearest to the positively charged body move across the contact surface toward the positive charges; simultaneously, the electrons of the negatively charged body move across that contact surface toward the conductor. The action is a continuous one throughout the entire conductor until an equilibrium condition of the balance of charge has occurred, resulting in the neutralization of all the excess charges.

This action may be looked upon as a conversion of energy. The two originally charged bodies, because of the attractive force between them, represent a source of potential energy.

If we desire a continuous transfer of charge in the conductor—and we do in order to maintain a continuous current flow—we see that it becomes necessary to obtain a device that can maintain a pair of bodies in an oppositely charged

state even when they are externally connected by means of a conductor. This device must be capable of maintaining the condition of the charged bodies by the motion of an equivalent charge through the device itself, and this separation of charges can be accomplished only by the conversion of energy from another form to electrical energy within the activation device. Alessandro Volta, an Italian physicist, developed such a device, which has become known as the voltaic cell or battery.

A device in which the flow of electric current produces only heat is known as a resistor. The current through a resistor must always flow from a terminal of higher potential to a terminal of lower potential.

Dr. George Simon Ohm studied experimentally the relationship between the potential difference and the current and in 1826 published the results of his investigation. Dr. Ohm discovered that for a particular metallic conductor, held at a constant temperature, the relationship between the potential difference across the terminals of the conductor and the current through the conductor is linear. Thus, if the potential difference is doubled, the current is also doubled. If a graph is drawn of potential difference against current, a straight line, passing through the origin, is obtained. The slope of this line is constant and represents the ratio of the potential difference across the conductor to the current in the conductor; this ratio is called the resistance of the conductor. Mathematically this relationship is expressed as:

$$C = \frac{V}{R}$$

where C is the current in amps, V is the voltage and R is the resistance in ohms.

The above formula is known as Ohm's law for a metallic conductor at a constant temperature. This law is used very frequently throughout circuit analysis and design.

References

Vitrogan, David, *Elements of Electric and Magnetic Circuits*, Rinehart press, 1971. The reader may reference other elementary physics books for additional information on this topic.

Swan, Frank and Palmer, Warren, *Basic DC Circuits* available at Radio Shack Stores. Full of simple experiments involving the concepts presented here.

COMPUTER SCIENCE PRESS, INC.

COMPUTER CHESS SERIES

CHESS AND COMPUTERS
by David Levy

A description of how computers play chess and a detailed history of computer chess from the earliest chess playing machines up to present research projects.
$7.95 Paper — $11.95 Hard

1975 U.S. COMPUTER CHESS CHAMPIONSHIP
by David Levy

Analysis of the sixth annual tournament and of a simultaneous exhibition match between the author, an international chess master, and the computers.
$4.95 Paper — $6.95 Hard

"... Entertaining and instructive ... works are complementary and would be well obtained together." *Library Journal 12/1/76*

1976 U.S. COMPUTER CHESS CHAMPIONSHIP
by David Levy

A description of the 1976 U.S. Computer Chess Championship which was held in Houston, Texas in October, 1976. It contains a detailed description and analysis of that tournament by David Levy, the tournament director.
$4.95 Paper March, 1977

As a special offer all three books are available with a 10% discount plus $1.50 for postage and handling.

Please add 10% to all prices for orders outside the U.S. and Canada
Residents of California please add 6% sales tax
Prices subject to change without notice
Postage and handling charge 75¢ per book
Prepayment required

Send orders to
SCCS Interface
P. O. Box 54751-A
Los Angeles, California 90054

Circle No. 25 on Inquiry Card

Personalized health care for your computer:
Another in a long line of firsts.
Many of you have already bought equipment from us. You know that we were the first to carry many of America's leading brands of personal computing products and the software to go with them. What you may not know is that we have our own staff computer doctor. He has his very own personalized health care plan for your computer.
We think it's rather unique.
the computer mart
How our health care program for your computer takes care of you.
This program assures that you will be as happy with your computer as you thought you would be. If you run into a snag, all you have to do is call us immediately. Our doctor will come to the rescue. With a lot more help than two aspirins.
Our health care program makes good business sense.
The Computer Mart health care program for computers is based on a very simple idea. That giving you and everything you buy from us the best possible care is the best way to keep you coming back. And that is the only way we are going to grow. You will get everything you pay for, plus. A big promise, these days!
Taking care of home computerists all over America.
If you want to keep your valuable computer equipment working right and your current project on the right track, check us out. By calling or writing today! We're taking care of home computerists all over America! We are The Computer Mart,
633-B West Katella Avenue, Orange, CA 92667
(714) 633-1222.
"...introducing: america's first real health care plan for computers"

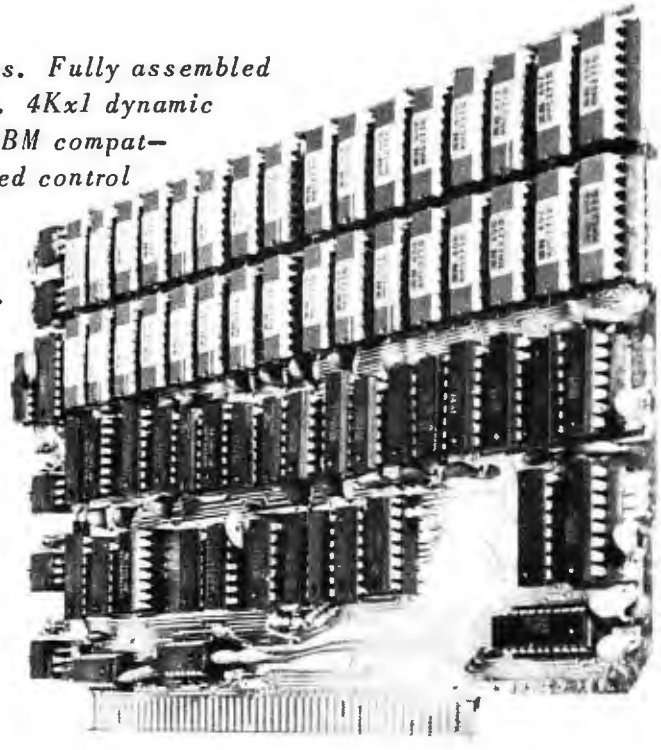
Circle No. 26 on Inquiry Card

16384 BYTES for $485.00

assembled (with sockets) : tested - burned-in - guaranteed

A new high in S100 bus memory cost effectiveness. Fully assembled (with sockets), tested, burned–in and guaranteed. 4Kx1 dynamic memory chips (the same ones used by the ton in IBM compat–ible memory systems) combined with self contained control logic, yield a memory system with:

- *Low power consumption, total board 5 watts.*
- *Transparent refresh, which means the memory looks static to the outside world.*
- *No waiting. In fact, xrdy is not even con–nected to the memory.*
- *Full DMA capability*
- *Reliable, low level clock and control signals.*



Dynabyte

Dynabyte® brings to the S–100 Bus a state of the art, industrial quality memory system. 16K on a single board for $485.00, Guaranteed for 1 year.

for more information call or write to:

R.H.S. MARKETING

2233 El Camino Real
Palo Alto, California 94306
(415) 321–6639

DEALER INQUIRES INVITED

B of A & MASTERCHARGE ACCEPTED

BYTE OF SAN MATEO
1200 W. Hillsdale Blvd.
San Mateo, Ca. 94403
(415) 341–4200

BYTE OF PALO ALTO
2227 El Camino
Palo Alto, Ca. 94306
(415) 327–8080

Circle No. 27 on Inquiry Card

Unclassified

Each month SCCS Interface will devote this space to free, non-commercial advertising by members. This is done as a service of the Southern California Computer Society and to help promote communications between computer experimenters and hobbyists throughout the world.

The only exception to this policy is in the case of ads seeking or offering employment. In such cases, the membership requirement is dropped.

To place your free ad, write or type your ad and mail to:
Karen Wolff,
P.O. Box 5429,
Santa Monica, California 90405

Plotter Interface Needed

HELP! Compucorps P5P Plotter information needed to allow interface to Altair 8800. Art Armstrong 3345 Moore St., Los Angeles, Ca. 90066 (213) 397-3874.

Tutor Needed

I am a ham and looking for someone who would be able to come to my home and tutor me in microcomputing. I can pay a fair fee. Ed Rothchild, 2725 Monte Mar Terrace, L.A. 90064 (213) 870-5173 (evenings).

Help!

I need a schematic or any other information on a Freiden 2018620 260026 Assy, PCB Keyboard 1F P010. I will pay for copying and a finder's fee. Bill Seeger, BOX 2744, Keesler AFB, Miss 39534, phone (601) 435-4790.

Job Needed

Computer programmer needs a job. Experienced in Fortran, Cobol, and Univac assembler. Lee Shackelford, 718 17th St., Santa Monica 90402. 393-1203.

VDM, Cassette for Sale:

Polymorphic VTI/64 video module, $200. Morrow's Godbout Cassette interface, fully expanded, $120. Both working with IC's socketed. Postage paid in U.S.A. Shipped within 24 hours of receipt of MO or certified check. Tom Burke, 150 Church St., Burlington, VT 05401.

Access to Synthesizer Needed

Artist needs occasional use of a good synthesizer to make sounds for sound drawings. Contact Karen Wolff, 127 Brooks Ave., Venice, Ca. 90291, (213) 399-7107.

COMPUTERLAND

is now OPEN...
In stock & on display:

* SWTP MP-68 Microcomputer
* IMSAI 8080 Microcomputer

We also offer:

* ETC-1000 Assembled Prototyping for: 6502; Z-80; 6800; 8080
* SPHERE 300
* Hardware & Software assistance
* User group meetings and program exchanges.
* Expert kit building and repair service.

Drop in and get acquainted. Ask for opening discounts.

Tues-Fri 11:30-7:30
Saturday 11:00-6:00
Sun, Mon CLOSED

16919 A. Hawthorne Boulevard
Lawndale, California 90260
(213) 371-4010

Circle No. 28 on Inquiry Card

IMSAI 8080
WITH 22 SLOT
MOTHER BRD.
& 280 CPU
$865.

SOL-20 AND
NORTH STAR DISC

ARE HERE NOW —

COME SEE THEM BEFORE THEY ARE SOLD OUT!

WE ALSO STOCK AND SERVICE:

CHROMEMCO	TDL 16K MEM.	ALPHA MICRO 16/8
POLYMORPHIC	SANYO	ALSO:
SWTP	TARBELL	CONNECTORS
LEAR ADM-3	ICOM FLOPPY	SOCKETS
SEALS 8K	ASR-33	I.C.'s
TDL Z-80	OAE	BOOKS
SOROC	HITACHI	SUPPLIES

THE NEW
BYTE SHOP
16508 HAWTHORNE BLVD.
LAWNDALE, CA 90260
(213) 371-2421
HRS: TUE.-FRI. 12-8, SAT. 10-6
BANKAMERICARD • MASTERCHARGE

Circle No. 29 on Inquiry Card

trolled robot project in their newsletter. The robot, called Buster II, was built by 14 year old Tod Loofbourrow.

Buster II is still in development. Presently it can be controlled by a joystick or a program stored in memory. In its final stage of development, now in progress, it will have a bumper input-stimulus system and program to search for a battery charger to recharge its batteries when they run down.

The robot uses an MOS Technology KIM-1 microprocessor system, and 3 DC motor driven wheels A potentimeter-comparator feedback loop is used to control the wheels position. A feedback voltage is compared to the joystick control voltage to provide input to the mpu (refer to figure). The mpu processes this data, makes necessary corrections and determines the control voltages necessary for the respective motors. The result is that the robot can pivot on its axis and move in any given direction at variable speeds, with great precision.

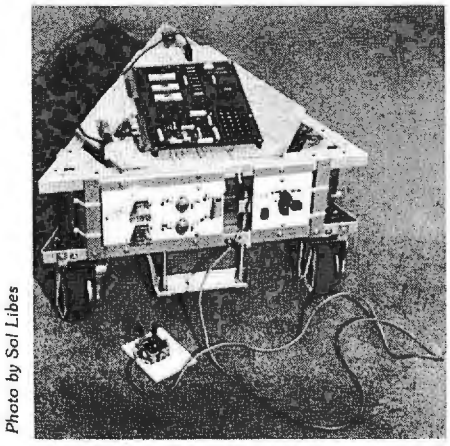


Photo by Sol Libes

Close-up view of BUSTER. There are 3 DC motor/gear/wheel assemblies. The front wheel is driven by a 4th DC motor thru the large gear visible on the front. Note the pot mounted on top of the steering shaft. This pot furnishes the feedback signal to the ADC comparator circuit. The connectors located between the pot and the KIM-1 are used to connect the cassette recorder to the KIM-1 to load programs.

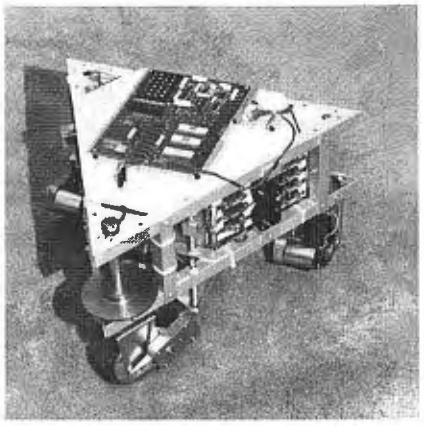


Photo by Sol Libes

Rear view of BUSTER II. Note the KIM-1 MPU on top and motor driven circuitry (left rear) and ADC circuitry (right rear). The battery (84 Amp/Hr) can be seen protruding from the bottom. The Joy-stick controller (lying on the floor) is connected to robot via cable.

For further information, you can contact the ACG-N.J. Newsletter, UCTI, 1776 Rariton Road, Scotch Plains, N.J. 07076. A subscription is only $4 per year. We also understand that a commercial magazine will feature Buster soon, but couldn't find out which one in time for publication.

Go, John!

A friend of mine noted that the English contracted the two letters uu to w and thus one could think of u as the square root of w. He then went on to make the comment that only the square root of one letter separated a UART from a WART. John Borders.

Hobby Computers Big at Wescon

According to IEEE Wescon conference organizer Ed Peterson, there were 34 technical sessions this year and the one on hobby computing was, by far, the most widely attended. In fact, attendance at that session was 32% higher than the next most popular! Sales of the session preprints were only eighth in popularity, perhaps due to their more general nature.

Task Examiner for 8080 Systems

by Edward I. Comer

This subroutine examines a word in the "A" register for the presence of ones. If no ones are found, the program jumps to a preset default address. If ones are present, the bit position number of the rightmost one is recorded in the "B" register and the rightmost one in the "A" register is set to zero.

The subroutine program is intended to be used as a task examiner for a main program. Each bit relates to a task. The main program uses this routine to examine a flag word for ones set by other programs requesting work.

Relative Octal Address (RA)	Octal Code	Mnemonic	Comments
0	006	MVI B	Clear "B"
1	000	000	
2	117	MOV C, A	Load "C" with data word
3	036	MVI E	Load "E" with 1
4	001	001	
5	243	ANA E	And A with E
6	312	JZ	Jump if bit is not a one
7	•	RA 13 (L)	
10	•	RA 13 (H)	
11	251	XRA C	Zero right most one
12	311	RET	C(B) = right most bit position
13	004	INR B	
14	173	MOV A, E	
15	027	RAL	Examine one bit to the left
16	332	JC	Jump if all bits = 0
17	•	RA 26 (L)	
20	•	RA 26 (H)	
21	137	MOV E, A	Restore "E"
22	171	MOV A, C	Restore "A"
23	303	JMP	Try again, with next bit
24	•	RA 5 (L)	
25	•	RA 5 (H)	
26	343	XTHL	Default, no one in word
27	311	RET	Default – H & L contain original Return

The subroutine is entered using a CALL with the data to be examined in "A" and the default address in "H" & "L". Exit is with the right most bit position in "B", the modified input in "A" and the original input in "C". Edward I. Comer, 4818 Ferncrest Dr., Greensboro, N.C. 27410, (919) 294-0147.

SYSTEM DESIGN - A DISCIPLINE IN TRANSITION

System design is experiencing rapid and exciting changes. COMPCON 77 Spring will bring together leading computer specialists and innovators to examine these changes, their causes, their implications, and their directions in the future. Participate in the discussion of these vital areas of current interest:

WHAT ARE THE CHANGES?

New designs in computers and computer subsystems . . . from concepts to hardware . . . from computers on a chip to networks of computers.

THE CAUSES?

Advances in component and memory technology, in software/firmware engineering, in systems/applications engineering,

THE IMPLICATIONS?

To computer applications, to design methodology, to design support systems (e.g., design simulation and automation), to the designers themselves.

THE FUTURE?

What will it be, and why?

SESSIONS AND CHAIRMEN

COMPUTER ELEMENTS
Mathew Slana
Bell Labs

ELEMENT RELIABILITY & TESTING
John Moran
Bell Labs

NEW SYSTEM DESIGN — MEDIUM SYSTEMS
Don Savitt
Microdata

NEW SYSTEMS DESIGN — THE SMALL COMPUTER
Jack Peterson
Xerox

DIRECTIONS IN MICROCOMPUTER SYSTEM DESIGN
Ed Lee
Prolog

ENGINEERING DESIGN OF AN EXPERIMENTAL SOFT DISPLAY WORD PROCESSOR
Jack Shemer
Xerox

WHAT HAVE WE LEARNED ABOUT SUPER COMPUTER DESIGN
Sid Fernbach
Lawrence Livermore Laboratories

DESIGN AUTOMATION
Steven Su
Utah State University

PERSONAL COMPUTERS
Lou Fields
SCCS

THE WORLD SCENE: MICROS-TO-SUPER (Panel)
Angeline Pantages
Datamation

MASS STORAGE & DATA BASE MANAGEMENT CONSIDERATIONS
Steve Miller
SRI

PACKAGING TECHNOLOGIES
James Licari
Rockwell International

RELIABLE COMPUTER ARCHITECTURES
Ray Nilsen
Hughes Aircraft

MASS STORAGE FOR MICROPROCESSORS
Tony Kolk
Alkem

SOFTWARE ENGINEERING
Jim Chandler
Hughes Aircraft

BUBBLE MEMORY APPLICATIONS
William Mavity
Rockwell International

MINI-MICROPERIPHERALS
Bud Bleaninger
Microdata

CAREER & EDUCATIONAL IMPACTS OF NEW TECHNOLOGIES
C. M. Davis
IBM

DIRECTIONS IN MICRO-ARCHITECTURES
Bernie Peuto
Zilog

NEW LSI TECHNOLOGIES
To Be Announced

DIRECTIONS IN FAULT TOLERANT COMPUTERS
John Meyers
University of Michigan

MICROS IN NETWORKS
Ron Waxman
IBM

SHORT NOTES
M. Graham
UC Berkeley

POT-POURRI SESSION
Ron Colman
Cal. State Fullerton

TWO TUTORIALS
* LSI TESTING
* MICROPROCESSOR SOFTWARE

FEBRUARY 28-MARCH 3

spring COMPCON 77

FOURTEENTH IEEE COMPUTER SOCIETY INTERNATIONAL CONFERENCE
JACK TAR HOTEL, SAN FRANCISCO, CALIFORNIA

For complete advance program write to P.O. Box 639, Silver Spring, MD 20901

New Products

Continued from Page 45

Z 80 Reference Card

Circle No. 33 on Inquiry Card

This inexpensive reference card will be seen as an invaluable tool by all Z 80 users. It simplifies the rich and complex Z 80 op code structure. The card contains 696 op code mnemonics; 9 format structures; 87 symbolic operations; all flag relations, definitions and instructions; and directions for use. The price for one is $3.00, with quantity discounts. Write, Fred McNeill, Fred's Firm, P.O. Box 6305, Denver, Colorado 80206.

RCA ASCII Keyboard Documentation Package

Circle No. 34 on Inquiry Card

Do you have an RCA ASCII Keyboard built by George Risk Industries? A documentation package, showing how to use it effectively with your system, includes:

- Construction information for a simple, three-chip interface circuit for use with a processor technology 3P+S or other parallel input port.
- Description of the keyboard logic functions, explaining the purpose of all those extra diodes, and how they allow you to make the unit do what *you* want it to.
- How to add CONTROL, ESCAPE, DELETE, CANCEL, NULL, LINE FEED, , , cursor control functions, lighted keyswitches, and more!
- How to easily add or delete lower case ASCII characters.
- How to obtain new keyswitches, custom engraved keytops, and other replacement parts.
- A large, redrawn schematic, showing all logic actually present and correcting errors present in the original schematic.

This ten page (plus schematic) package is available for $5.00 from LMC Engineering, 185 South Alice Way, Anaheim, California 92806.

Advertising Index

Information Inquiry Number		Page
10	A-Vid Electronics Co.	36
9	Byte Shop Inc.	20
29	Byte Shop of Lawndale	53
11	Byte Shop of Pasadena	37
14	Computer Components	41
28	Computerland	53
26	Computer Mart	51
13	Computer Music Symposium	40
5	Computer, Power & Light	8
25	Computer Science Press	51
12	Computer Store	38
3	Digital Group	5
8	Dutronics	19
27	Dynabyte	52
1	Godbout	Inside Front Cover
34	Industrial & Scientific Conference Management, Inc.	Inside Back Cover
7	Jade Co.	14
30	M&R Enterprises	56
32	MITS	Back Cover
6	Ohio Scientific Instruments	11
15	Personal Computing Conference	42
4	PolyMorphic Systems	6
31	Synapse	56
24	Szerlip Enterprises	49
23	Tarbell Electronics	49
2	Technical Design Labs	1
22	West Coast Computer Faire	46

RF MODULATOR KIT

KIT INCLUDES:

Modulator (Ch3, Ch4)
60Db Switch
8Ft. RF Cable
4Ft. Video Cable
Battery Clip
On/Off Switch
Instructions

* *Limited Supply* *
$24.95 + $1 Postage & Handling
(Calif. Residents add 6½% Tax)

mar enterprises
P.O box 61011, sunnyvale, california 94088

Circle No. 30 on Inquiry Card

WHAT'S A SYNTHESIZER?

THE ELECTRONIC MUSIC MAGAZINE
Synapse

SUBSCRIBE TO SYNAPSE. Send $6.00 for a 1 year/6 issue subscription or, for the current issue only, send $1.25 plus 50¢ postage. Include a check or money order payable to Synapse and mail it to Synapse/Subscription Dept. A, 2829 Hyans Street, Los Angeles, California 90026.

See you at the Computers in Music Symposium, February 19th.

Circle No. 31 on Inquiry Card

Join SCCS...

the international society for computer buffs

ACCOUNT NO. (10) | 5993 | MEMBERSHIP APPLICATION | DATE

SOUTHERN CALIFORNIA COMPUTER SOCIETY
(213) 322-6028, (213) 472-0388

5 ☐ NEW
6 ☐ RENEW
8 ☐ CHANGE ADDRESS

1 ACCOUNT NAME (30) _____ PHONE (7) ___-____

CYCLE (2)

2 ADDITIONAL NAME OR COMPANY NAME (30) _____ CR RATING (3)

AREA CODE

3 STREET ADDRESS (30) CITY, STATE (25) ZIP (5) _____

Annual dues $10 includes $1 SCCS INTERFACE magazine
Make Check Payable to:
Southern California Computer Society, Box 54751, Los Angeles, CA. 90054

ACCOUNT NO. (10) | 5993 | MEMBERSHIP APPLICATION | DATE

SOUTHERN CALIFORNIA COMPUTER SOCIETY
(213) 322-6028, (213) 472-0388

5 ☐ NEW
6 ☐ RENEW
8 ☐ CHANGE ADDRESS

1 ACCOUNT NAME (30) _____ PHONE (7) ___-____

CYCLE (2)

2 ADDITIONAL NAME OR COMPANY NAME (30) _____ CR RATING (3)

AREA CODE

3 STREET ADDRESS (30) CITY, STATE (25) ZIP (5) _____

Annual dues $10 includes $1 SCCS INTERFACE magazine
Make Check Payable to:
Southern California Computer Society, Box 54751, Los Angeles, CA. 90054

INTERNATIONAL MICROELECTRONICS CONFERENCE

Puts It All Together For YOU!

Largest Microelectronics Technical Program of any West Coast Show!

9 Technical Sessions to Help You Keep Pace With the Rapidly Changing World of Microelectronics Manufacturing

1. Microprocessor PC Boards (Comparison of Three Testing Techniques)
2. Low Cost Packaging
3. Microelectronic Bonding
4. Microelectronic Device Standardization
5. Microprocessor Applications
6. Semiconductor Packaging
7. Aerospace and Microelectronics
8. Reliability Considerations
9. Thin Film Deposition

Full Range Exhibition of Microelectronics Processing Equipment, Materials and Instruments!

See hundreds of products used in the manufacture of microelectronic circuits and components, systems and equipment. Free admission to all men and women actively engaged in electronic and microelectronic circuit packaging and production. Get your Free admission coupon today!

SPECIAL "MICROPROCESSOR SHOWCASE!"

See an array of Microprocessors. As an adjunct to Microprocessor Technical Sessions, this "Showcase" will enhance the value of the Program for you.

SUPER BONUS FOR ALL ATTENDEES!

"How To Build Your Own Microcomputer"

Free 3-part Symposium acquaints you with the operation, construction and capabilities of microcomputers. A great opportunity!

TUES/WED/THURS: 5 - 7 PM
Organized and conducted by the Southern California Computer Society (International Computer Society)

nepcon '77 west | AND THE **international microelectronics conference**

MARCH 1-3, 1977 ANAHEIM CONVENTION CENTER ANAHEIM, CALIFORNIA

Together, The Largest Electronic Packaging And Production Show Ever Presented Anywhere... DON'T MISS IT!

OVER 850 DISPLAYS

More NEW PRODUCTS than ever! A complete range of the equipment, materials, tools, hardware and test instruments needed for producing electronic and microelectronic circuits, components, systems and equipment.

FOR REGISTRATION COUPON, CONTACT

Industrial & Scientific Conference Management, Inc.
222 West Adams Street
Chicago, Illinois 60606
(312) 263-4866

HOURS:
Registration begins at 8:30 AM

EXHIBITS
Tues. and Wed., 11:30 AM - 6:00 PM
Thursday, 11:30 AM - 5:00 PM

TECHNICAL SESSIONS
9:30 AM - 12:30 PM and 1:30 - 4:30 PM

SEMINARS
Tues., 9:30 AM - 12:30 PM; Wed., beginning at 6:00 PM

OPEN FORUMS
Tues. and Wed., beginning at 6:00 PM

PROFESSIONAL ADVANCEMENT COURSE
Tues., Wed. and Thurs., 2:00 - 4:30 PM

Now you can buy an Altair™8800b or an Altair 680b computer right off the shelf. Altair plug-in boards, peripherals, software and manuals are also available. Check the list below for the MITS dealer in your area.

off the shelf.

ALTAIR COMPUTER CENTER
8105 SW Nimbus Ave.
BEAVERTON, OR 97005

COMPUTER KITS (S.F. area)
1044 University Ave.
BERKELEY, CA 94710
(415)-845-5300

THE COMPUTER STORE
(Arrowhead Computer Co.)
820 Broadway
SANTA MONICA, CA 90401
(213)-451-0713

GATEWAY ELECTRONICS, INC.
OF COLORADO
2839 W. 44th Ave.
DENVER, CO 80211
(303)-458-5444

COMPUTER SHACK
3120 San Mateo N.E.
ALBUQUERQUE, NM 87110
(505)-883-8282; 883-8283

ALTAIR COMPUTER CENTER
4941 East 29th St.
TUCSON, AZ 85711
(602)-748-7363

ALTAIR COMPUTER CENTER
611 N. 27th St. Suite 9
LINCOLN, NB 68503
(402) 474-2800

COMPUTER PRODUCTS UNLIMITED
2412 Broadway
LITTLE ROCK, AR 72206
(501)-371-0449

ALTAIR COMPUTER CENTER
110 The Annex
5345 East Forty First St.
TULSA, OK 74135
(918)-664-4564

ALTAIR COMPUTER CENTER
5750 Bintliff Drive
HOUSTON, TX 77036
(713)-780-8981

COMPUTERS-TO-GO
4503 West Broad St.
RICHMOND, VA 23230
(804)-335-5773

MICROSYSTEMS (Washington, D.C.)
6605A Backlick Rd.
SPRINGFIELD, VA 22150
(703)-569-1110

THE COMPUTER STORE
Suite 5
Municipal Parking Building
CHARLESTON, W. VA. 25301
(304)-345-1360

THE COMPUTER ROOM
3938 Beau D'Rue Drive
EAGAN, MN 55122
(612)-452-2567

THE COMPUTER STORE
OF ANN ARBOR
310 East Washington Street
ANN ARBOR, MI 48104
(313)-995-7616

THE COMPUTER STORE, INC.
(Hartford area)
63 South Main Street
WINDSOR LOCKS, CT 06096
(203)-627-0188

CHICAGO COMPUTER STORE
517 Talcott Rd.
PARK RIDGE, IL 60068
(312)-823-2388

GATEWAY ELECTRONICS, INC.
8123-25 Page Blvd.
ST. LOUIS, MO 63130
(314)-427-6116

BYTE'TRONICS
Suite 103
1600 Hayes St.
NASHVILLE, TN 37203
(615)-329-1979

THE COMPUTER STORE, INC.
120 Cambridge St.
BURLINGTON, MA 01803
(617)-272-8770

ALTAIR COMPUTER CENTER
269 Osborne Road
ALBANY, NY 12211
(518)-459-6140

THE COMPUTER STORE
OF NEW YORK
55 West 39th St.
NEW YORK, NY 10018
(212)-221-1404

THE COMPUTER SYSTEMCENTER
3330 Piedmont Road
ATLANTA, GA 30305
(404)-231-1691

MARSH DATA SYSTEMS
5405 B Southern Comfort Blvd.
TAMPA, FL 33614
(813)-886-9890

mits

Circle No. 32 on Inquiry Card